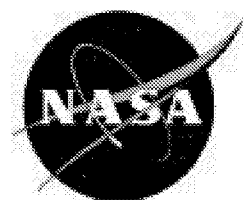


NASA/SP—1999-7011/SUPPL489  
April 19, 1999

# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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<b>51</b>	<b>Life Sciences (General)</b>	<b>1</b>
<b>52</b>	<b>Aerospace Medicine</b> Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.	<b>6</b>
<b>53</b>	<b>Behavioral Sciences</b> Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	<b>28</b>
<b>54</b>	<b>Man/System Technology and Life Support</b> Includes human engineering; biotechnology; and space suits and protective clothing.	<b>31</b>
<b>55</b>	<b>Space Biology</b> Includes exobiology; planetary biology; and extraterrestrial life.	<b>N.A.</b>

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# Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

## Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
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7. Abstract
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# AEROSPACE MEDICINE AND BIOLOGY

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*A Continuing Bibliography (Suppl. 489)*

APRIL 19, 1999

51

## LIFE SCIENCES (GENERAL)

19990025370 NASA Goddard Inst. for Space Studies, New York, NY USA

**Oxygen Isotopes in Fresh Water Biogenic Opal: Northeastern US Allerod-Younger Dryas Temperature Shift**

Shemesh, Aldo, Weizmann Inst. of Science, Israel; Peteet, Dorothy, NASA Goddard Inst. for Space Studies, USA; *Journal of Geophysical Letters*; 1997; 16p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The first oxygen isotope analysis of biogenic opal from lake sediments, from the Allerod/Younger Dryas transition in a core from Linsley Pond, Connecticut, gives an average estimate of a 6 C drop in temperature during the Younger Dryas. This shift represents temperatures during the bloom season, and may be less than the winter temperature drop. The sharp transition itself, with a duration of about 200 years, suggests that the temperature decrease may have been as large as 12 C. Previous estimates of the Allerod/Younger Dryas temperature shifts are controversial, and range from 3-20 C, suggesting that further interdisciplinary research on the same samples is warranted. One way that global climate change manifests itself is by redistributing energy throughout the globe. The Northern Hemisphere latitudinal temperature gradient during the late-glacial is at present a controversial topic. The magnitude of air temperature shifts during the Allerod/Younger Dryas (YD) oscillation are estimated from mid-latitude pollen records surrounding the North Atlantic to be 3-5 C in Europe [Lowe et al., 1994] and 3-4 C in the eastern US [Peteet et al., 1993]. In contrast, lake temperatures estimates derived from aquatic midge larvae in the Canadian eastern maritimes and Maine range from 6-20 C, with larger shifts at more southern sites [Levesque et al., 1997]. The magnitude of YD cooling in Greenland ice cores ranges from at least 7 C from the Bolling warming [Dansgaard et al., 1989] to 15 C - a more recent estimate from borehole temperatures [Cuffey et al., 1995]. The ice core geochemical records reveal that massive frequent and short-term (decadal or less) changes in atmospheric composition occurred throughout this event, suggesting a very dynamic circulation [Mayewski et al., 1993].

Author

*Atmospheric Composition; Geochemistry; Glaciers; Periodic Variations; Temperature Gradients; Estimates; Climate Change; Climatology*

19990025375 Baylor Coll. of Medicine, Houston, TX USA

**The Study of Leukocyte Functions in a Rotating Wall Vessel *Final Report***

Trial, JoAnn, Baylor Coll. of Medicine, USA; [1998]; 5p; In English

Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this study was to investigate the behavior of leukocytes under free-fall conditions in a rotating wall vessel. In such a vessel, the tendency of a cell to fall in response to gravity is opposed by the rotation of the vessel and the culture medium within, keeping the cells in suspension without fluid shear. Previous reports indicated that such functions as lymphocyte migration through collagen matrix or monocyte cytokine secretion are altered under these conditions, and these changes correlate with similar functional defects of cultured cells seen during spaceflight.

Derived from text

*Culture Techniques; Free Fall; Lymphocytes; Immune Systems; Immunology; Endothelium; Microorganisms*

19990025652 Prins Maurits Lab. TNO, Rijswijk Netherlands

**Set-up of a System to Reliably Measure the Startle Response in Marmoset Monkeys; Application in Animal Models of Anxiety and Psychosis *Final Report***

Meichers, B.P.; Groen, B.; Vanwersch, R.A.; Philippens, I.H.; Bruijnzeel, P.L.; Jul. 1998; 29p; In English

Report No.(s): AD-A359300; TNO-PML-1998-B42; TDCK-TD98-0082; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The acoustic startle response is a reflex motor response elicited by a sudden loud sound. In two psychiatric disorders, the startle reflex is altered. Normally, the startle response is decreased appreciably when a low intensity sound stimulus is given shortly before the startle eliciting stimulus. This prepulse inhibition of the startle is nearly absent in patients suffering from schizophrenia. In addition, the startle response is increased during periods of anxiety. In this study, a system is described by which the acoustic startle response in marmoset monkeys may be recorded in a reliable way. In using this system, it could be shown that marmosets possess a pre-pulse inhibition (PPI) of the ASR, similar as in other species. Furthermore, it was shown that a fear potentiation of the startle response may be elicited in the marmoset. Potentially, this system may be used for testing anti-psychotic or anxiolytic activity of drugs in primates. In this study, a series of drugs with a known activity on PPI or fear potentiation of the ASR was tested to validate the system. The effects of Buspiron and Diazepam were tested as examples of drugs with a known anxiolytic effect. In addition, Fluvoxamine and Haloperidol were used in these experiments. Amphetamine, Ketamine and Haloperidol were used as drugs to affect the PPI; in these experiments Diazepam was used as a negative control. These experiments were performed in a randomized, cross-over design. In the fear potentiated startle experiments, four animals were used. They received, following a training period to establish a stable baseline fear potentiation, three dose levels of each of the drugs. In addition, the animals were injected with saline S times spread evenly over the total duration of the experiment to test the stability of the baseline fear potentiation. The four animals used in the PPI group were subjected to a similar dosing schedule.

DTIC

*Evoked Response (Psychophysiology); Schizophrenia; Psychoses; Monkeys; Fear; Animals; Amphetamines*

19990025775 Armed Forces Radiobiology Research Inst., Bethesda, MD USA

**Animal Studies of Residual Hematopoietic and Immune System Injury From Low Dose/Low Dose Rate Radiation and Heavy Metals**

Yagunov, A. S.; Tokalov, S. V.; Chukhlov, A. B.; Afanassiev, B. V.; Sep. 1998; 32p; In English

Contract(s)/Grant(s): DNA-001-96-C-0047

Report No.(s): AD-A359088; CR98-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The interaction of low dose/low dose rate radiation with heavy metals (in this report cadmium and lead) is important for at least two reasons: 1) radiation workers and populations exposed to unusually high background levels of radiation (e.g. Chernobyl and the Techa river in Russia) receive this type of exposure rather than the much better studied prompt high dose exposure, and 2) radiation accidents frequently involve the release of other contaminants as well. Even at low radiation doses and dose rates, the effects of simultaneous or near simultaneous exposure to cadmium or lead, which are marrow toxicants in their own right, are additive or synergistic to those of radiation. Although there is an adaptive response to low dose rate exposures, recovery of marrow precursor cells after a second exposure may be incomplete. Detection of damage repair changes after low dose exposures is difficult. The authors describe possible mechanisms for the observed delayed or incomplete recovery. They also address the complex pathogenic changes seen when heavy metals are introduced along with the radiation. The implications of their findings in rodent models for human populations are discussed, and the importance and proposed directions of further work in this field described.

DTIC

*Background Radiation; Additives; Delay*

19990025927 General Accounting Office, National Security and International Affairs Div., Washington, DC USA

**DOD Animal Research: Improvements Needed in Quality of Biomedical Research Database**

Dec. 1998; 15p; In English; Report to Congressional Committees.

Report No.(s): AD-A359441; GAO/NSIAD/HEHS-99-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In 1992, congressional concerns were expressed about the lack of disclosure of the Department of Defense's (DOD) animal use programs and activities. In response, DOD began submitting annual reports to the Congress in 1994. In 1995, to respond to continued congressional concerns and direction, DOD established the Biomedical Research Database (BRD) containing information on individual research projects and training programs involving animals being conducted by its laboratories, military hospitals and bases, and contractors. House Report 103499, issued by the House Armed Services Committee in its consideration of the National Defense Authorization Act for fiscal Year 1995, directed us to examine several issues related to DOD'S administration of its animal research programs. We are examining the extent to which DOD'S research using animals addresses validated military objectives, does not unnecessarily duplicate work done elsewhere, and incorporates methods to reduce, replace, and refine the use of animals. In the course of doing this work, we identified problems with the quality of information in the BRD. The purpose of this report is to bring these problems to your attention. We are continuing our work on the broader issues and will report the results of our review of DOD'S use of animals in research at a later date.

DTIC

*Data Bases; Congressional Reports; Education; Biomedical Data*



19990025969 Department of Energy, Office of Energy Research, Washington, DC USA

**New tool for protein fold recognition: A Bayesian heuristic threading algorithm**

Crawford, O., Department of Energy, USA; Oct. 31, 1997; 12p; In English; 2nd; Computational molecular biology

Report No.(s): DE98-001254; ORNL/CP-95145; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper presents a new threading algorithm, designed to be used in protein fold recognition. Its purpose is to contribute toward the goal of predicting three-dimensional structures of proteins from knowledge of their amino-acid sequences alone. Sequences for new proteins are being discovered at a rapid rate, as a result of the Human Genome Project, and related genome research. Understanding of protein folding, and especially the ability to predict the 3D fold from the sequence, is crucial to the understanding of the function of these new proteins. This is considered by many to be the most important problem in contemporary molecular biology. Numerical tests of the speed and reliability of the algorithm are described, along with comparisons with two popular threading algorithms. For the systems examined, the new method constitutes a significant improvement.

NTIS

*Proteins; Folding; Bayes Theorem; Heuristic Methods; Algorithms; Molecular Biology*

19990026314 Japan Society of Aerospace and Environmental Medicine, Tokyo, Japan

**Japanese Journal of Aerospace and Environmental Medicine, Volume 35**

Mano, Tadaaki, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Ando, Hideki, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Koga, Kazuo, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Ohira, Yoshinbu, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Sugeno, Junichi, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Hirayanagi, Kaname, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Mori, Sigeo, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Satake, Hirotaka, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Taya, Yasushi, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Kakimoto, Yukiko, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Nakamura, Akio, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Sudoh, Masamichi, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; June 1998; ISSN 0387-0723; 71p; In English; See also 19990026315 through 19990026319; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Contents include the following: Day dreaming about human colonization of space should not substitute for basic research on the role of gravity on earth. Influence of microgravity on Mitogen Motility and Cytoskeleton Patterns of T lymphocytes and Jarkat cell-experiments on sounding rockets. Rotating systems used as microgravity simulators for studies of Cartilage differentiation. Clinostat rotation promotes HGF/SF-induced morphogenesis of rat pancreatic oval cells. Neuronal responses to vector-averaged gravity: a search for gravisensing and adaptation mechanisms a preliminary report.

CASI

*Aerospace Environments; Medical Science; Gravitational Effects; Microgravity; Research; Simulators*

19990026315 Nagoya Univ., Space Medicine Research Center, Nagoya, Japan

**Day Dreaming About Human Colonization of Space Should not Substitute for Basic Research on the Role of Gravity on Earth**

Koga, Kazuo, Nagoya Univ., Japan; Japanese Journal of Aerospace and Environmental Medicine; June 1998; Volume 35, No. 2, pp. 23-26; In English; See also 19990026314

Contract(s)/Grant(s): MOE-10301005; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Day dreaming scientists have been talking about the dream of future space life emphasizing the highlight of them, but never pick up the shadow behind it. It is extremely important to have an basic idea that our behavior in a daily life on the earth is controlled by the gravity from the cell level to the higher cortical functions as a whole. With using the gravity cue we are controlling our behavior without any consciousness. This has been done not only by an individual personal experience but also by the longitudinal evaluation which has a long historical elapsed time. We have already know many negative aspect of the microgravity to the human body including not only total body but also the simple cell culturing, such as de-calcifications from the bone, disadvantage of cumulative exposure for the space radiation, difficulty of early development for the embryo without gravity, and so on. Life science research is just on the way how the gravity plays all important role to the living organ on the earth. Clinostat experiments gives us a lot of knowledge from the usual cell level experiments in our own laboratory without expecting uncertain flight opportunity and expensive budget. There are several advantages to apply the clinostat rotations to the cell level experiments. One is the extended long term cell biological experiments on the earth with less expensive facilities. Another advantage of the clinostat experiment can be easily put into the daily biology research activities without taking into account the special equipments or facilities comparing with the flight experiments. BY introducing the clinostat method, we can re-evaluate the gravity importance by

doing the ground base experiments and test our hypothesis by flowing same schematic experiments under the real microgravity environments.

Author

*Extraterrestrial Radiation; Research; Microgravity; Human Body; Gravitational Effects*

19990026316 Eidgenoessische Technische Hochschule, Space Biology, Zurich, Switzerland

**Influence of Microgravity on Mitogen Binding, Motility and Cytoskeleton Patterns of T Lymphocytes and Jurkat Cells: Experiments on Sounding Rockets**

Cogoli-Greuter, Marianne, Eidgenoessische Technische Hochschule, Switzerland; Spano, Alessandra, SASSari Univ., Italy; Sciola, Luigi, SASSari Univ., Italy; Pippia, Proto, SASSari Univ., Italy; Cogoli, Augusto, Eidgenoessische Technische Hochschule, Switzerland; Japanese Journal of Aerospace and Environmental Medicine; June 1998; Volume 35, No. 2, pp. 27-39; In English; See also 19990026314; Original contains color illustrations

Contract(s)/Grant(s): SNRF-31-25181.88; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effects of microgravity on T lymphocytes and Jurkat cells a T lymphoid cell line was studied on sounding rocket flights with microgravity phases lasting between 1- and 13 minutes. Automated pre programmed instruments permitted the injection of fluorescent labeled concanavalin A, culture medium and/or fixative at preset times. A microscope, telemanipulated from the ground and connected to a CCD camera permitted to record cell motility and interactions in microgravity. On MAXUS 2, an in flight 1 g - centrifuge allowed the comparison of the data obtained in microgravity with a 1 g control having the same history related to launch and re-entry. Chemically fixed cells were labeled after flight either with monoclonal anti vimentin or anti -tubtulin followed by fluorescent anti-mouse Ig. First, while binding of concanavalin A to the cell membrane is not affected in microgravity, patching of the receptors is significantly retarded in microgravity. Second, cell motility and cell-cell contacts are taking place also when cells are free floating in microgravity. Third, marked alterations in the structure of the intermediate filaments of vimentin as well as the microtubules network are observed in microgravity. Most evident is the appearance of large bundles in the vimentin structure, significantly increased in the microgravity samples. These results indicate that direct effects of microgravity on the cytoskeleton are likely whereas little changes occur at the membrane level, and are in agreement with recent data showing that gravity controls the pattern of microtubule formation. The existence of active movements and cell-cell contacts supports but does not prove - the notion that T cells can communicate and transmit signals in microgravity.

Author

*Microgravity; Culture Techniques; Gravitation; Lymphocytes*

19990026317 Texas Univ., Dept. of Orthodontics and Dentofacial Orthopedics, Houston, TX USA

**Rotating Systems Used as Microgravity Simulators for Studies of Cartilage Differentiation**

Duke, Pauline Jackie, Texas Univ., USA; Montufar-Solis, Dina, Texas Univ., USA; Japanese Journal of Aerospace and Environmental Medicine; June 1998; Volume 35, No. 2, pp. 41-54; In English; See also 19990026314

Contract(s)/Grant(s): NIH-RR-05970; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Just as Studies of abnormal chondrogenesis produced by mutation or teratogen add to our understanding of the normal chondrogenic process, studying chondrogenesis in space may assist in 1 g studies of chondrogenic defects. Opportunities to study cartilage differentiation in space, however, are limited, so systems have been developed which can be used at 1 g to simulate microgravity. One model used to mimic effects of microgravity is the clinostat a rotating system which converts gravity from a vector quantity to a scalar quantity. In slow rotating clinostat systems, cells are attached to a substrate as at 1 g, and rotated with the plane of the culture perpendicular to the gravitational field. Another rotating system used as a microgravity simulator is the Slow Turning Lateral Vessel (STLV) which uses a rotating cylindrical vessel, completely filled with medium to culture cells in suspension without subjecting them to damaging shear forces. Embryonic limb cells cultured in the slow rotating clinostat, the STLV, and in space exhibit changes in chondrogenesis related to the stage at which the cells are exposed. Clinorotation decreases the number of nodules in micromass cultures, showing an effect on the condensation process. In micromass cultures flown in space, condensation occurred preflight, so the primary effect of microgravity exposure was on matrix production. In chondrocytes in the STLV, as in growth plates of spaceflown rats, hypertrophy was decreased. Future clinostat and spaceflight experiments will examine the effect on adhesive molecules and on cytoskeletal organization because of their involvement in the processes that are affected. The mechanisms by which micro-gravity alters phenotype modulation, matrix production and aggregation, and chondrocyte hypertrophy after the cartilage phenotype is established must also be elucidated. The mechanisms resulting in cartilage defects are to a large extent unknown, and microgravity may provide a way to identify them.

Author

*Rotation; Microgravity; Simulators; Cartilage; Gravitational Fields*

19990026318 National Cancer Inst., Molecular Oncology Section, Frederick, MD USA

**Clinostat Rotation Promotes HGF/SF-Induced Morphogenesis of Rat Pancreatic Oval Cells**

Rulong, Shen, National Cancer Inst., USA; Takagishi, Yoshiko, Nagoya Univ., Japan; Koga, Kazuo, Nagoya Univ., Japan; Resau, James H., National Cancer Inst., USA; Inouye, Minoru, Nagoya Univ., Japan; Jeffers, Michael, National Cancer Inst., USA; Rao, Sambasiva M., Nagoya Univ., Japan; Murata, Yoshiharu, Nagoya Univ., Japan; Japanese Journal of Aerospace and Environmental Medicine; June 1998; Volume 35, No. 2, pp. 55-61; In English; See also 19990026314

Contract(s)/Grant(s): MOE-10301005; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The clinostat is a key device to produce a vector averaged gravitational environment which mimic microgravity. NNe studied an effect of vector averaged gravity on branching tubular morphogenesis of rat pancreatic epithelial oval cells treated with hepatocyte growth factor/scatter factor (HGF/SF) using a clinostat. The pancreatic oval cells are believed to be the stem cells for hepatocytes and the pancreatic ductal gland. The cells in the slide flask filled with culture medium containing or not containing HGF/SF were kept on the clinostat to rotate against the gravity direction at 10 or 60 rpm for 72 hours. For the rotational control condition, the cells were subjected to horizontal rotation. The flasks were placed in the same incubator as the stational control condition. The HGF/SF treated oval cells formed branching tubular structures in all conditions including 10 and 60 rpm clinostat. Semithin sections of oval cells embedded in resin showed that these tubular structures contain lumen. Immunofluorescent studies with anti Met anti-body showed intense Met expression along the branching tubular structures. Rhodamine-phalloidin staining showed that F actin is highly involved in tubular branching morphogenesis. These oval cells also showed positive albumin staining, implying that functionally, at least, they are partially differentiated toward hepatocytes. In 60 rpm clinostat, however, a more branching and complicated tubular network was formed than in 10 rpm clinostat and rotational/stational controls. It seems that faster rotating clinostat promotes tubular morphogenesis.

Author

*Culture Techniques; Rotation; Rhodamine; Microgravity; Gravitational Effects*

19990026319 Arizona Univ., Dept. of Physiology, Tucson, AZ USA

**Neuronal Responses to Vector-Averaged Gravity: A Search for Gravisensing and Adaptation Mechanism: A Preliminary Report**

Gruener, Raphael, Arizona Univ., USA; Japanese Journal of Aerospace and Environmental Medicine; June 1998; Volume 35, No. 2, pp. 63-83; In English; See also 19990026314; Sponsored in part by Japan Dept. of Science; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper serves as a milepost in our work using the clinostat as a tool for mimicking certain aspects of altered gravity conditions (vector-nulled gravity) in order to gain insights into the adaptation of cells (and hence organisms) to the microgravity environment of space. I review here recent data, limited to cellular adaptation to altered gravity environments, from others in the field, and including some of our work using the clinostat and from spaceflight experiments. Finally, I report here preliminary results of experiments, carried out initially at Nagoya University's RIENM with follow-up experiments at the University of Arizona. to test the applicability of PC12 cells as neuronal models in which to assess adaptation to altered gravity conditions. PC12 (phaeochromocytoma) cells were used to examine two central hypotheses. The first is that the ubiquity of the cytoskeletally tethered nucleus of cells serves as a general gravisensing device which may be incidental to its other, more central genomic control role. The second hypothesis is that the clinostat is a useful, earth- bound platform on which to carry out space biology relevant experiments in preparation for testing in space flights. PC12 cells were triggered to differentiate, into neuron like cells, by the addition of Nerve Growth Factor (NGF) to the culture medium within 4-6 hours after cell plating and just before mounting cultures on the clinostat and control devices. Cultures, in 60 mm or 35 mm polylysine coated dishes, were subjected to clinorotation, centrifugal force, motional controls and shear turbulence control conditions for varying periods. Experiments were carried out at 37 C. Cell morphology (including neurite characteristics) and gene activation were examined. Cytoskeletal integrity was assessed from the staining of tubulin and actin filaments. Confocal microscopy in combination with fluorescence monitoring was undertaken. At this point of the investigation, only preliminary data can be presented. This is due to various technical problems and the need to carry out rigorous statistical tests. Still, the preliminary data are of interest because they form the foundation for interpretation against the background of cellular gravisensing and adaptation to gravitational perturbations.

Author

*Neurophysiology; Microgravity; Research; Centrifugal Force; Cells (Biology); Culture Techniques; Gravitational Effects*

19990026394 Department of Energy, Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC USA  
**Enzyme catalysts for a biotechnology-based chemical industry** *Quarterly Report, 29 Sep. - 28 Dec. 1997*

Arnold, F. H., Department of Energy, USA; Jan. 15, 1998; 6p; In English

Report No.(s): DE98-006141; DOE/CH/10578-T1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The goal of this research is to engineer enzymes to be efficient and economically attractive catalysts for the chemical industry. The author is attempting to demonstrate generally-applicable approaches to enzyme improvement as well as develop specific catalysts for potential industrial application. In this report attention is focused on random mutagenesis of pNB esterase -- improved activity and stability. The most thermostable esterases obtained by sequential random mutagenesis (6H7) and random mutagenesis plus recombination (6sF9) each contain 9 amino acid mutations and a number of silent mutations, relative to the wild-type sequence. Eight of the mutations are present in both genes, for a total of ten potentially adaptive mutations. Because several of these mutations occurred in the same generation, it is difficult to identify the mutations responsible for the increases in activity and stability. In order to aid in this identification, the thermostable genes were recombined with the wild-type gene, in hopes of removing neutral mutations. The gene from the first- generation variant, with five amino acid substitutions was also recombined with wild-type.

NTIS

*Enzymes; Catalysts; Biotechnology; Chemical Engineering*

19990026419 National Inst. of Health, Bethesda, MD USA

Flow cytometry-based DNA hybridization and polymorphism analysis

Cai, H., National Inst. of Health, USA; Kommander, K., National Inst. of Health, USA; White, P. S., National Inst. of Health, USA; Nolan, J. P., National Inst. of Health, USA; Dec. 31, 1998; 8p; In English; BIOS 1998: Biomedical optics

Report No.(s): DE98-003495; LA-UR-98-284; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Functional analysis of the humane genome, including the quantification of differential gene expression and the identification of polymorphic sites and disease genes, is an important element of the Human Genome Project. Current methods of analysis are mainly gel-based assays that are not well-suited to rapid genome-scale analyses. To analyze Deoxyribonucleic Acid (DNA) sequence on a large scale, robust and high throughput assays are needed. The authors are developing a suite of microsphere-based approaches employing fluorescence detection to screen and analyze genomic sequence. The approaches include competitive DNA hybridization to measure DNA or Ribonucleic Acids (RNA) targets in unknown samples, and oligo ligation or extension assays to analyze single-nucleotide polymorphisms. Apart from the advances of sensitivity, simplicity, and low sample consumption, these flow cytometric approaches have the potential for high throughput multiplexed analysis using multicolored microspheres and automated sample handling.

NTIS

*Deoxyribonucleic Acid; Cytometry; Polymorphism*

## 52

### AEROSPACE MEDICINE

*Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.*

19990025374 Texas Univ., Anderson Cancer Center, Houston, TX USA

Role of Dendritic Cells in Immune Dysfunction *Final Report*

Savary, Cherylyn A., Texas Univ., USA; Jun. 30, 1998; 8p; In English

Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The specific aims of the project were: (1) Application of the NASA bioreactor to enhance cytokine-regulated proliferation and maturation of dendritic cells (DC). (2) Compare the frequency and function of DC in normal donors and immunocompromised cancer patients. (3) Analyze the effectiveness of cytokine therapy and DC-assisted immunotherapy (using bioreactor-expanded DC) in a murine model of experimental fungal disease. Our investigations have provided new insight into DC immunobiology and have led to the development of methodology to evaluate DC in blood of normal donors and patients. Information gained from these studies has broadened our understanding of possible mechanisms involved in the immune dysfunction of space travelers and earth-bound cancer patients, and could contribute to the design of novel therapies to restore/preserve immunity in these individuals. Several new avenues of investigation were also revealed. The results of studies completed during Round 2 are summarized.

Derived from text

*Bioreactors; Therapy; Immune Systems; Immunology; Microbiology*

19990025385 Naval Health Research Center, San Diego, CA USA

Effects of Repeated Doses of Caffeine during 64 Hours of Sleep Deprivation on Subsequent Recovery Sleep *Final Report, Jun. 96*

Kelly, Tamsin; Gomez, S.; Ryman, D.; McGeoy, S.; Rubin, R.; Dec. 1998; 18p; In English

Report No.(s): AD-A359343; NHRC-96-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Both military operations and civilian emergencies may require sustained work, entailing prolonged periods with little or no sleep. Under these conditions, stimulants, most commonly caffeine, often are used to try to maintain alertness. However, stimulants can interfere with subsequent sleep, decreasing sleep's recuperative effects on alertness and performance. Caffeine has been well documented to impair sleep, generally causing increases in sleep latency and wake time, with reductions in the deeper sleep stages. Situations where less than a full-night's sleep occurs prior to returning to work would make such sleep impairment particularly problematic. The purpose of this study was to evaluate the effects of caffeine, administered in repeated doses during 64 hr of sleep deprivation, on alertness and performance during sleep deprivation and, in a subset of subjects, on subsequent nighttime recovery sleep. The focus of this report is caffeine effects on recovery sleep; effects on performance have been reported elsewhere. Nocturnal polysomnography was performed before and after 64 hr without sleep.

Author (DTIC)

*Sleep Deprivation; Caffeine; Alertness; Military Operations*

19990025457 NASA Langley Research Center, Hampton, VA USA

Aerospace Medicine and Biology: A Continuing Bibliography with Indexes, Supplement 487

Mar. 22, 1999; 27p; In English

Report No.(s): NASA/SP-1999-7011/SUPPL487; NAS 1.21:7011/SUPPL487; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This supplemental issue of Aerospace Medicine and Biology, A Continuing Bibliography with Indexes (NASA/SP-1999-7011) lists reports, articles, and other documents recently announced in the NASA STI Database. In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. Two indexes-subject and author are included after the abstract section. CASI

*Bibliographies; Aerospace Medicine; Bioastronautics; Biological Effects; Exobiology; Indexes (Documentation)*

19990025468 NASA Johnson Space Center, Houston, TX USA

Multidimensional Flow-Cytometric Analysis of Dendritic Cells in Peripheral Blood of Normal Donors and Cancer Patients

Savary, Cherylyn A., Texas Univ., USA; Graziutti, Monica L., Texas Univ., USA; Melichar, Bohuslav, Texas Univ., USA; Przepiorka, Donna, Texas Univ., USA; Freedman, Ralph S., Texas Univ., USA; Cowart, Richard E., Texas Univ., USA; Cohen, David M., Texas Univ., USA; Anaissie, Elias J., Texas Univ., USA; Woodside, Darren G., Texas Univ., USA; McIntyre, Bradley W., Texas Univ., USA; Pierson, Duane L., NASA Johnson Space Center, USA; Pellis, Neal R., NASA Johnson Space Center, USA; Rex, John H., Texas Univ., USA; Cancer Immunol Immunother; 1998; Volume 45, pp. 234-240; In English

Contract(s)/Grant(s): NCC9-36; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

We studied the potential of multidimensional flow cytometry to evaluate the frequency and maturation/activation status of dendritic cells in minimally manipulated peripheral blood mononuclear cell preparations (i.e., only separated on Ficoll-Hypaque) of normal donors and cancer patients. A rare subset of HLA-DR(+) leukocytes less than 1% mononuclear cells) was detected in blood of normal donors that displayed all the features of dendritic cells: these cells had high forward-light-scatter characteristics and coexpressed CD4, CD86 and CD54 surface antigens, but lacked the lineage-associated surface markers of T cells, B cells, monocytes, granulocytes or NK (i.e. they were CD(3-), CD(19-), CD(20-), CD(14-), CD(11b-), CD(16-), CD(56-)).

Author

*Cytometry; Blood; Cancer; Biological Effects; Leukocytes*

19990025563 National Aeromedical Center, Soesterberg, Netherlands

**Feedback of Anti-G Straining Performance of Pilots: The Use of the Late Ear Pulse Waveform as a Feedback Signal for Blood Pressure *Final Report***

Holewijn, M., National Aeromedical Center, Netherlands; vandeEndt, M., National Aeromedical Center, Netherlands; Rijkeljkhuizen, J., National Aeromedical Center, Netherlands; Los, M., National Aeromedical Center, Netherlands; Jul. 1998; 23p; In English

Report No.(s): AD-A359055; 1998-K4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As a part of a joint study of the National Aeromedical Institute (Soesterberg, the Netherlands), the National Aerospace Laboratory (Amsterdam, the Netherlands) and the Polish Air Force Institute of Aviation Medicine (Warsaw, Poland) an in-flight experiment was performed to evaluate the use of psycho-physiological measures as feedback parameters of physiological and mental strain. The main goal of this study was to evaluate the use of the ear pulse arterial waveform as a potential feedback parameter of a pilot blood pressure status during accelerations. The results of this study showed that the amplitude of the ear pulse waveform decreases with increasing acceleration during aerobatic profiles. The pulse transit time (PIT) of the ear pulse waveform increases with increasing acceleration during aerobatic profiles. These changes agree with the hypothesis that these changes reflect a decrease in blood pressure on head level during these profiles. Heart rates did not show a correlation with the acceleration levels during the investigated aerobatic profiles. It is discussed that this is the result from the response time of heart rate regulations, being not fast enough to follow the changes of the accelerations in the aerobatic profiles. The results of this study support the use of the amplitude and the PIT of the ear pulse waveform as an online feedback parameter of changes in blood pressure at head level, during exposure of a pilot to accelerations.

DTIC

*Pulses; Heart Rate; Ear; Blood Pressure; Evaluation; In-Flight Monitoring; Stress (Psychology); Physiology*

19990025601 Institute of Space Medico, Beijing, China

**Changes of cerebral blood flow under lower body negative pressure**

Hu, Zhihong, Institute of Space Medico, China; Zhao, Guoxuan, Institute of Space Medico, China; Yang, Jingsheng, Institute of Space Medico, China; Zhong, Chongfa, Institute of Space Medico, China; Chen, Xuemei, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 364-368; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The cardiovascular effects and hemodynamics in the common carotid artery during supine lower body negative pressure (LBNP, 0, -2.7 kPa, -4.0 kPa, -5.3 kPa and -6.7 kPa) were studied in 11 young male volunteers with Color Doppler Ultrasound monitoring. The LBNP lasted for 5 min, 2 min, 3 min, 5 min, 10 min respectively. All the subjects except one finished the test. Changes of cardiac output(CO), blood pressure (BP) and calculated systemic vascular resistance(SVR) were measured. Changes of cerebral blood flow were estimated from changes of blood flow in the common carotid artery. Stroke volume and cardiac output decreased together with a small decrease in cerebral blood flow(CBF) when negative pressure increased, but the ratio between CBF and CO increased significantly.

Author

*Blood Flow; Cerebrum; Blood Pressure; Cardiovascular System; Lower Body Negative Pressure*

19990025602 Institute of Space Medico, Beijing, China

**Effect of Hypoxia on pilot's cerebral oxygen saturation and blood volume**

Yu, Yaorong, Institute of Space Medico, China; Bi, Kexu, Institute of Space Medico, China; Tian, Guangqing, Institute of Space Medico, China; Hu, Suwei, Institute of Space Medico, China; Shi, Xiuling, Institute of Space Medico, China; Zang, Yunning, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 360-363; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Effects of hypoxia (10.5% V) on cerebral oxygen saturation (ScO<sub>2</sub>) and blood volume (BV) in the brain were studied in 60 pilots. A noninvasive and continuous near infrared instrument was used to monitor ScO<sub>2</sub> and BV. Five pilots didn't complete the experiments, because their blood pressure (BP) and heart rate (HR) changed too large during the hypoxia. ScO<sub>2</sub> of 80% normal subjects returned to control level in 8 min recovering time. But BV of all 60 subjects didn't return to control value in 10 min recovering period. The changes of ScO<sub>2</sub> and BV of 5 subjects who didn't complete the experiments were significantly different from those that of normal group during hypoxia (P less than 0.01). We believe that this near-infrared instrument is very useful for monitoring hypoxia.

Author

*Hypoxia; Pilots (Personnel); Cerebrum; Blood Volume; Near Infrared Radiation; Anoxia; Oxygen Consumption*

19990025615 Institute of Space Medico, Beijing, China

**A study on improvement of tolerance to 21 d HDBR - 6 degree in young men by Qigong practice**

Song, Kongzhi, Institute of Space Medico, China; Zhang, Jingxue, Institute of Space Medico, China; Xie, Junshui, Institute of Space Medico, China; Shan, Yi, Institute of Space Medico, China; Sun, Yongen, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 341-348; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Weightlessness is simulated with - 6 deg head down bedrest (HDBR - 6 deg). 10 healthy male subjects aged 19-21 years served as subjects. 5 men undergone Qigong training were classified as Qigong group. The other 5 men without Qigong training served as the control. They all underwent HDBR - 6 deg for 21d. Qigong training are performed 3 times a day 50 min a time in Qigong group. Cardiac output (CO), heart rate (HR) electrocardiogram (ECG), body weight (BW), circumference of leg, pulse graph, H reflex, concentration of SOD, Ca(++) in blood, tolerance to orthostatic tilt were measured and Chinese medical examination was made. The results indicated that BW and circumference of leg in Qigong group decreased less as compared with the control. Subjective sensation and objective symptoms were less severe and CO decreased less as compared with the control. The total peripheral resistance of cardiovascular system decreased and the pulse pressure increased as compared with control group. The nervous transmission speed was higher and concentration of SOD and Ca(++) in blood was lower than that of the control group. It showed that Qigong practice increased the tolerance to simulated weightlessness in young men.

Author

*Weightlessness Simulation; Bed Rest; Attitude (Inclination); Head Down Tilt; Physiological Effects; Weightlessness; Human Tolerances; Acceleration Tolerance; Orthostatic Tolerance*

19990025616 Institute of Space Medico, Beijing, China

**Comparison of effects of two Qigong methods on counteragent to simulated weightlessness**

Xie, Junshui, Institute of Space Medico, China; Song, Kongzhi, Institute of Space Medico, China; Shan, Yi, Institute of Space Medico, China; Zhang, Jingxue, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 335-340; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Healthy subjects were divided into three groups. The control group includes 10 male aged 19.8 +/- 1.4 years; Qigong group I includes 17 male aged 20.7 +/- 1.6 years; Qigong group II includes 50 male aged 22.5 +/- 1.9 years. The subjects in control group has not been trained, while subjects in Qigong I and Qigong II have been trained to practice Qigong but with different methods for one year. Head - down - tilt(- 30 deg) for 30 min was used as weightlessness simulation. Changes of stroke volume(SV), lower limb blood flow(LBF), blood pressure, heart rate and temperature at Shanzhong, Laogong were measured and compared. The results clearly showed that both Qigong groups had improved counteragent against weightlessness stimulation and the method used by Qigong group II is more effective.

Author

*Weightlessness Simulation; Blood Pressure; Head Down Tilt; Blood Flow; Heart Rate; Physiological Effects; Weightlessness*

19990025617 Institute of Space Medico, Beijing, China

**Spectral analyses of respiration and R - R interval under spontaneous respiration**

Xu, Guolin, Institute of Space Medico, China; Peng, Yuankai, Institute of Space Medico, China; Zhang, Ruguo, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 330-334; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A system with which ECG and respiratory signals sampled and analyzed synchronously was set up. It could recognize the respiratory wave(component of high frequency) in the R - R spectrum, and was used for the analysis of heart rate variability. The spectra of R - R interval and respiratory waves of 8 subjects during quiet sitting, quick calculation, exercise or inspiration of low concentration oxygen with spontaneous respiration were analyzed. The power of middle frequency / the power of high frequency(MF/HF), heart rate, and respiratory frequency increased significantly during quick calculation, as compared with those during quiet sitting. It indicates that MF/HF is sensitive to brain work. It was also demonstrated that when the same experimental data were analyzed with 0.15-0.5 Hz as high frequency band of the difference of nervous activities between quick calculation and quiet sitting was not revealed. This suggested that it may be the respiratory wave and the middle frequency band in the R - R interval spectrum that reflect the changes of cardiovascular autonomic nervous activity.

Author

*Spectrum Analysis; Respiration; Nervous System; Electrocardiography; Cardiovascular System*

19990025619 Institute of Space Medico, Beijing, China

**Mechanism of circulatory and respiratory failure caused by large amounts of air in the circulatory system**

Jinfu, Yuan, Institute of Space Medico, China; Zhongyi, Ji, Institute of Space Medico, China; Yangsheng, Jin, Institute of Space Medico, China; Quan, Wang, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 324-328; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

To confirm the hypothesis that the pathogenic mechanism of air infusion in the circulatory system is not bubble blockade of blood vessels but the consequence of anoxia of the vital organs, different amounts of air were injected into the great saphenous vein of 22 dogs, and then heart rate, cardiac rhythm and bubble sound were monitored with a Doppler probe at the precordial region. The result showed that in the 17 dogs that had received continued air infusion and maintained a degree - IV bubble sound, increase of respiration and heart rate and then arrhythmia, bradycardia, intensive abdominal breathing, weakness, dropping of tongue and failure to stand up were observed. Closed cardiac massage was performed immediately on 10 in the 12 animals that had continued slow air infusion till cessation of breathing, of which 8 recovered respiration and returned to normal; autopsy was performed in the other 2 that were not resuscitated and large amounts of air bubbles were found in the right atrium and ventricle, the venae cavae, and pulmonary vessels. This experiment suggested that large amounts of air had greatly changed the inner composition of the heart chamber and pulmonary vessel and thus caused ischemia and anoxia of myocardium and the respiratory and circulatory centers.

Author

*Cardiovascular System; Respiration; Circulatory System; Heart Function; Dogs; Air; Bubbles; Aeroembolism; Decompression Sickness*

19990025620 Institute of Space Medico, Beijing, China

**Changes of endothelial cell count and morphology after inhalation of low oxygen gas mixture**

Chen, Jianhe, Institute of Space Medico, China; Yu, Yaorong, Institute of Space Medico, China; Dong, Qi, Institute of Space Medico, China; Shen, Xianyun, Institute of Space Medico, China; Meng, Jingrui, Institute of Space Medico, China; Zang, Yunning, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 313-316; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The number and morphology of circulating endothelial cells (CEC) in 60 fighter pilots were observed before and after inhalation of low oxygen gas mixture. The results showed that the number of CEC increased from  $1.03 \pm 0.48$  (cell/microliter) to  $3.73 \pm 0.57$  (cell/microliter) after inhalation of low oxygen gas mixture and the difference was statistically significant. It was also found that correlation exists between the degree of change and their daily habit. It is believed that the endothelial cells of blood vessels can be damaged by acute inhalation of low oxygen gas mixture which is responsible for the occupational disease of the pilots.

Author

*Cells (Biology); Endothelium; Oxygen; Gas Mixtures; Respiration*

19990025658 Texas Univ., Anderson Cancer Center, Houston, TX USA

**In-Vitro Induced Immunosuppression in a Rotary Cell Culture System *Final Report***

Grimm, Elizabeth A., Texas Univ., USA; Mar. 31, 1998; 2p; In English

Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The function of the innate immune system is to provide a first-line of defense against infectious organisms, via control of bacterial and viral growth using antigen nonspecific means. These nonspecific immune effectors include macrophages and Natural Killing (NK) cells, and certain cytokines elicited in response to "super antigens" on the infectious agents. This innate system usually keeps most infectious agents from rapidly growing while the adaptive immune system is generating a specific response complete with immunologic memory. Compelling evidence suggests that space flight results in various immunosuppressive effects, including reduced innate and adaptive immune responses. We were particularly concerned with reduced NK activity at landing, and have asked whether the microgravity component of space flight could be responsible for the previously observed NK defect. We have conclusively demonstrated that simulated microgravity as provided by the Synthecon bioreactors does not inhibit the NK function nor the IL-2 activation of lymphokine-activated killing (LAK). Interleukin-2 is the key cytokine responsible for activation of NK cells to express LAK, as well as to support differentiation of lymphocytes during adaptive immune responses. Therefore, we have disproved our original hypothesis based on poor NK in many of the astronauts upon landing.

Derived from text

*Immune Systems; Immunity; Aerospace Medicine; Bioastronautics; Biological Effects; Microgravity; Antigens; Macrophages*



**19990025670** Advisory Group for Aerospace Research and Development, Aerospace Medical Panel, Neuilly-Sur-Seine, France  
**Aeromedical Support Issues in Contingency Operations** *Le Soutien Aeromedical Lors des Operations non Programmees*  
September 1998; 420p; In English; In French, 29 Sep. - 1 Oct. 1997, Rotterdam, Netherlands; See also 19990025671 through 19990025721

Report No.(s): AGARD-CP-599; ISBN 92-836-0059-2; Copyright Waived; Avail: CASI; A18, Hardcopy; A04, Microfiche

These proceedings include the Technical Evaluation Report, two Keynote Addresses, 53 papers and the edited discussions of the Symposium sponsored by the North Atlantic Treaty Organization (NATO/RTO) Aerospace Medical Panel. It was held in Rotterdam, N-E from 29 September - 1 October 1997. Contingency Operations constitute military missions such as peacekeeping, humanitarian aid, peacemaking/enforcement, full scale offensive operations and relief operations other than war, such as aid to civil powers in counterterrorism and in natural disasters. Increasingly, these operations will involve greater NATO participation in the post "Post-Cold-War" era. Significantly, NATO nations are turning to the application of science and technology, particularly computer resources, to address the unique problems associated with Contingency Operations. From a medical standpoint, there are many logistic, support and environmental factors which impede effective health and critical care medicine in Contingency Operations. This Symposium considered both the aeromedical problems encountered and the role of technological solutions as aids to resolving the issues in: (a) sustained and continuous operations, (b) medical management in remote locations, (c) medical information, and (d) adaptation to operational conditions. These proceedings will be of interest to heads of military health services, military and civilian officers concerned with the health and safety of personnel in air and support operations, research scientists, and those requiring a state-of-the-art review of medical "lessons learned" in Contingency Operations.

Author

*Conferences; Contingency; Medical Services; Operations Research; Research and Development; Human Factors Engineering; Medical Personnel; Telemedicine; Medical Equipment; Life Support Systems; Aerospace Medicine; Biological Effects; Aircraft Safety*

**19990025671** Royal Air Force, School of Aviation Medicine, Farnborough, UK

**Sustained Air Operations: Prolonged Duty Overnight**

Nicholson, A. N., Royal Air Force, UK; Stone, Barbara M., Defence Evaluation Research Agency, UK; Aeromedical Support Issues in Contingency Operations; September 1998; 14p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Sustained air operations imply round-the-clock scenarios and, inevitably, prolonged duty overnight. The ability of crews to cope with such work-rest patterns depends to a large extent on obtaining sufficient sleep during critical rest periods. Hypnotics may be essential to ensure sleep as the rest periods themselves are limited in number and duration, and occur at all times of the day and night. However, even if good sleep is attained during all the available rest periods, there may still be much difficulty in sustaining alertness during duty overnight, particularly if the duty periods themselves are prolonged. This paper deals with the use of various potential interventions to sustain alertness during intensive air operations.

Author

*Prolongation; Night; Alertness; Human Factors Engineering; Flight Crews; Aircraft Safety; Flight Safety; Aerospace Medicine; Biological Effects*

**19990025672** Armstrong Lab., Brooks AFB, TX USA

**Aircrew Performance During Extended Simulated Bomber Missions**

Whitmore, J., Armstrong Lab., USA; French, J., Armstrong Lab., USA; Armstrong, S., B-2 OT and E Team, USA; September 1998; 6p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Research was conducted to determine if fatigue impacted the performance of aircrew during long-duration bomber missions. Sustained flight in excess of 36 hours with only a minimal crew aboard was examined in two studies. Sixteen male USA Air Force B-1B bomber aircrew participated in the study. The participants served in crews of four and performed three 36-hour experimental periods (missions) in a high-fidelity B-1B simulator. The missions were interspersed with 36-hour rest breaks. Speech, cognitive, physiological (EEG, temperature), and subjective fatigue data were collected approximately every three hours for 11 trials per mission. A MANOVA analysis revealed a significant effect of trials for the aggregated measures ( $F(10,432) = 1.9885$ ,  $p$  less than 0.0001). This result, along with trend analyses, indicated a strong diurnal pattern in nearly all of the dependent measures. End-mission performance was similar to beginning-mission performance. Crews were able to perform the missions successfully; however, several areas of increased risk due to fatigue were observed. Crew rest strategies prior to, during, and following a mission are discussed. A second study is described which evaluated three long-duration B-2 missions.

Author

*Bomber Aircraft; Flight Crews; Pilot Performance; Flight Fatigue; Flight Safety; Aircraft Safety*

19990025673 Paris V Univ., Lab. of Applied Anthropology, France

**Rest Management and the Development of Signs of Fatigue in Pilots According to Work Shifts** *Gestion des Repos et Evolution des Manifestations de Fatigue chez les Pilotes selon les Rotations*

Mollard, R., Paris V Univ., France; Cabon, P., Paris V Univ., France; Mourey, F., Paris V Univ., France; Bougine, S., Paris V Univ., France; Coblenz, A., Paris V Univ., France; September 1998; 10p; In French; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Fatigue in airplane pilots constitutes one of the most often mentioned factors among reasons for reduced work performance. One of the available sources of information concerns the ASRS (Aviation Safety Reporting System), which allows American crews to report incidents confidentially. Analysis of these responses indicates that fatigue is explicitly mentioned in 4% of the events. Nevertheless, one can assume that fatigue is partially responsible for more than 20% of these incidents, given that other factors, such as inattention and communication problems, are often cited. Moreover, when pilots refer to fatigue, its associated causes prove to be quite diverse. Some pilots attribute it to lack of sleep, whereas for others long workdays or heavy workloads constitute the main causes for fatigue. One of the most frequently seen areas of confusion concerns the concept of sleepiness. Many studies conducted in real-life situations suggest that sleepiness and fatigue represent different ideas.

Author

*Work-Rest Cycle; Aircraft Pilots; Rest; Aerospace Medicine; Biological Effects; Flight Fatigue*

19990025674 Armstrong Lab., Combined Stress Branch, Wright-Patterson AFB, OH USA

**Evasive Maneuvers and High-G Flight Safety After Sleep Deprivation**

Chelette, T. L., Armstrong Lab., USA; Esken, R. L., Armstrong Lab., USA; Tripp, L. D., Armstrong Lab., USA; Alberty, W. B., Armstrong Lab., USA; September 1998; 10p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

It is a common situation in the current global reach/global power mission to require fighter pilots to deploy overseas on short notice and to require immediate duty. Up to thirty six hours of sleeplessness is a common status in this environment. The objective of this study was to assess the performance of trained simulator pilots performing flight relevant tasks in the stressful environment of high G under two conditions; rested and 24 hours of sleeplessness. Performance was also compared to self-assessment and self reported effort and fatigue. Limited data was collected concerning a 2-4 week lay-off from the task. Volunteers (eight men & eight women) were trained to fly the Dynamic Environment simulator in a closed loop configuration air combat maneuvering up to 9 Gz. Before and after each session, their total body isometric strength was measured. During each sortie, thirty performance measures at simultaneous multiple tasks were measured. After each session, subjects completed a subjective questionnaire and a standardized subjective workload assessment. Neither male nor female overall performance was significantly affected by sleep status, although individual tasks showed sensitivity; call-sign reaction time was longer by 33% and missile survival was considerably less likely. Also, perceived effort and physical demand were higher while perceived performance was lower when sleepless. Greater self reported effort on the anti-G straining maneuver correlated with better task performance and less post-G fatigue. Men are naturally stronger than women, however there was no significant decrease in strength due to G exposure in either the rested or sleepless conditions for either gender. Though sleep deprived pilots' subjective sensations may be that they are fatigued and unable to perform, objective measures show that their ability to conduct offensive maneuvers remains unchanged after 24 hours without sleep. However, when conversion to uncertain and spatially demanding defensive maneuvers occurs, survival may be compromised.

Author

*Sleep Deprivation; High Gravity Environments; Evasive Actions; Aircraft Maneuvers; Flight Crews; Pilot Performance; Aerospace Medicine; Bioastronautics; Biological Effects; Aircraft Safety*

19990025675 Netherlands Aerospace Medical Centre, Soesterberg, Netherlands

**Pros and Cons of Strategic Napping on Long Haul Flights**

Valk, P. J. L., Netherlands Aerospace Medical Centre, Netherlands; Simons, M., Netherlands Aerospace Medical Centre, Netherlands; September 1998; 6p; In English; See also 19990025670

Contract(s)/Grant(s): CAA-97.058; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Long haul operations involve rapid multiple time zone changes and long, irregular work schedules. These factors can result in sleep loss, circadian disruption, and fatigue with consequent effects on pilot's performance and alertness. A controlled nap in the cockpit is considered to be a useful countermeasure to inflight fatigue. Therefore, a study was conducted on the effects of a 40 minutes controlled rest period on the flight deck on crew performance and alertness. The alertness of the designated waking pilot, who has to remain alert while his colleague is resting, was explicitly assessed. Data was collected of 59 pilots, flying North-Atlantic B747-300 trips as scheduled in their regular duty roster. Pilots were equipped with a palmtop computer and an actigraph

for objective and subjective assessment of quantity and quality of cockpit naps, alertness, and performance on a vigilance dual-task. During flights, measurements were performed before and after the rest period and before top of descent. It was found that a cockpit rest period improved alertness and performance of the rested pilots up to top of descent. Sleep during the rest period provided more improvement than rest alone. A number of designated waking pilots had difficulties in maintaining a sufficient level of alertness during the rest period of their colleague pilot. It is recommended to implement the use of preplanned controlled rest periods on the flight deck as a preventive fatigue countermeasure in 2- and 3-person flight deck operations. Measures to safeguard the alertness of designated waking pilots and guidelines to secure flight safety are discussed.

Author

*Flight Safety; Aircraft Safety; Aerospace Medicine; Biological Effects; Flight Operations; Sleep Deprivation*

19990025676 Netherlands Aerospace Medical Centre, Soesterberg, Netherlands

**Early Starts: Effects on Sleep, Alertness and Vigilance**

Simons, M., Netherlands Aerospace Medical Centre, Netherlands; Valk, P. J. L., Netherlands Aerospace Medical Centre, Netherlands; September 1998; 8p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Early starts and irregular work schedules might lead to disruption of sleep-wake rhythms with consequent sleep loss and fatigue. Fatigue is known to be a contributing factor to operational errors. The aim of this study was to determine the effects of early reporting times and irregular duty schedules on sleep, alertness and performance of pilots flying short-haul operations. Method: 6 Captains flying short-haul charters were measured during two 4-week periods. Subjects were equipped with a palmtop computer and an actigraph for subjective and objective measurement of sleep parameters, alertness, and performance on a vigilance dual-task. Each day subjects had to perform measurements before, during, and after flights and before and after the main sleep period. Results: It was found that pilots reporting before 06:00 a.m. had a significant shorter total sleep time, impaired sleep quality, and impaired performance both pre-flight and at top of descent. To a lesser degree, this also applied for reporting between 06:00 and 09:00 a.m. Degradation of sleep was most significant during the night prior to the start of a new duty period. Conclusion: Performance was primarily affected by inadequate sleep related to reporting times before 06:00 a.m. It is recommended that reporting times before 06:00 a.m. should be avoided, whenever possible. Pilots who have to report early, should try to anticipate insufficient sleep by advancing their sleep phase. This can only be achieved when early starts are planned on a regular basis. When irregular early starts are unavoidable, it should be considered to compensate for sleep reduction by planning sufficient time for recovery sleep.

Author

*Sleep; Alertness; Wakefulness; Flight Fatigue; Aircraft Safety; Flight Safety; Aerospace Medicine; Biological Effects; Work-Rest Cycle*

19990025677 Lyon-1 Univ., Dept. de Medecine Experimentale, Lyon, France

**Neurobiological Basis of the Pharmacological Management of Sustained Alertness *Bases Neurologiques de la Gestion Pharmacologique de l'Eveil***

Jouvet, Michel, Lyon-1 Univ., France; September 1998; 1p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche; Abstract Only; Abstract Only

Since waking and sleep are regulated by two distinct systems, there are two different methods to increase the duration of waking, either by stimulating the waking systems or by inhibiting sleep-inducing mechanisms. Some advances in the understanding of the mechanisms of drugs acting upon the nervous system have been recently obtained by the development of immunohistochemistry of early genes. Among them, the immunohistochemistry of CFos protein is a good index of the neural systems which are activated after injection of drugs in animals. These data will be summarized together with the study of sleep which occurs after sustained wakefulness.

Derived from text

*Nervous System; Wakefulness; Alertness; Pharmacology*

19990025678 Army Aeromedical Research Lab., Fort Rucker, AL USA

**The Efficacy of Dextroamphetamine for Sustaining Helicopter Pilot Performance: An In-Flight Evaluation**

Caldwell, John A., Jr., Army Aeromedical Research Lab., USA; September 1998; 6p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The capability to operate 24 hours per day on the battlefield creates a tactical advantage over enemy forces. However, staffing shortages necessitating long work hours devoid of sleep eventually produce overwhelming fatigue, impairing performance and safety. In these situations, the only effective means to sustain performance may be the administration of stimulants. Unfortunately, studies of stimulants such as dextroamphetamine on the actual flight performance of aviators are virtually nonexistent. The present

study assessed actual in-flight performance, mood, and alertness of UH-60 pilots during sleep-deprivation periods in which they were given either a 10-mg dose of Dexedrine or a placebo at 0000, 0400, and 0800 within the last 23 hours of each period. Results indicated better control (smaller RMS errors) of several flight parameters (i.e., heading, altitude, airspeed, etc.) under Dexedrine than placebo during straight-and-levels, climbs, descents, right turns, and a left-descending turn. Tendencies toward Dexedrine-related improvements also occurred in the left turns and the Instrument Landing System approach. The Profile of Mood States revealed reductions in fatigue, confusion, and depression concurrent with increases in vigor as a function of Dexedrine. Electroencephalographic data indicated enhanced central nervous system arousal under Dexedrine relative to placebo. No significant side effects occurred. It can be concluded that dextroamphetamine effectively sustained aviator performance during short-term sustained operations.

Author

*Pilot Performance; Sleep Deprivation; Amphetamines; In-Flight Monitoring; Central Nervous System Stimulants*

19990025679 Institut de Medicine Aerospatiale Armee, Bretigny sur Orge, France

**Pharmacological Sleep Management: Interest of Modafinil** *Gestion Pharmacologique du Sommeil: Interet du Modafinil* Lagarde, Didier, Institut de Medicine Aerospatiale Armee, France; September 1998; 8p; In French; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

During sustained and continuous operations the sleep-wakefulness cycle is often disturbed: jet-lag, shift lag, prolonged sleep deprivation. The vigilance management in operational conditions includes pharmacological and non-pharmacological countermeasures. Sometimes non-pharmacological countermeasures, i.e, preventive, ergonomic and physical measures become inefficient or are inapplicable, so in these cases, military research teams are looking for pharmacological measures. There is a great variety of substances which may be used to reduce the effects of these sleep disturbances. These substances have to take place in a straight rule which could be resumed in 4 points: 1) an easy ingestion; 2) a quick effect after treatment; 3) a modulating time duration effect, dose-function; and 4) without side effects. Generally, three kinds of substances could be used: 1) hypnotic substances to induce a recovery sleep; 2) wakening substances to maintain a good level of vigilance; 3) synchronizer to resynchronize biological rhythms after jet-lag. In this work, the author presents an interesting synthetic substance called Modafinil (MODIODAL(R)). This substance is a medicine used to treat narcolepsy and hypersomnia. But modafinil could also act in healthy subjects, for example during a long sleep deprivation, and maintain a good level of vigilance and performance during 60 hours of continuous wakefulness. A neuroprotector effect at high dose has been demonstrated. The action mechanism of modafinil is complex. Modafinil modulates (as agonist) central post-synaptic alpha 1 noradrenergic receptor (wakefulness effect). At high doses, it increases dopamine level in nucleus accumbens (locomotor effect). It has also an indirect participation in the serotonergic system (wakefulness effect). It induces a decrease of cortisol liberation of the GABA (wakefulness effect), and induces moderate transient increase in aspartate and glutamate (wakefulness effect) followed by long lasting decrease of extra-cellular excitatory amino-acids (neuroprotector effect). Modafinil increases a brain metabolic energetic compound: the phosphocreatine, and it induces an activation of proto oncogen c-fos in anterior hypothalamic nucleus. Modafinil (MODIODAL(R)) appears as an interesting substance in SUSOPS and CONOPS, easy to take, with a dose-effect to modulate the action. No major side effect was described. It is a wakening substance and not an anti-sleep drug. Modafinil could be a very useful substance during real sustained operations but we have to take care of the wrong use.

Author

*Pharmacology; Sleep Deprivation; Drugs; Wakefulness; Central Nervous System Stimulants*

19990025680 Centre de Recherches du Service de Sante des Armees, La Tronche, France

**Modafinil Effects on Spatial Cognition During 60 Hours of Sleep Deprivation**

Raphel, Christian, Centre de Recherches du Service de Sante des Armees, France; Esquivie, Dominique, Centre de Recherches du Service de Sante des Armees, France; Stivalet, Philippe, Centre de Recherches du Service de Sante des Armees, France; Cian, Corinne, Centre de Recherches du Service de Sante des Armees, France; Baranski, Joseph V., Defence and Civil Inst. of Environmental Medicine, Canada; Leiffen, Daniel, Centre de Recherches du Service de Sante des Armees, France; Poquin, Didier, Centre de Recherches du Service de Sante des Armees, France; Barraud, Pierre-Alain, Centre de Recherches du Service de Sante des Armees, France; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Modafinil is currently being investigated in the context of sustained military operations as a potential countermeasure to the effects of extensive sleep deprivation (SD) on human cognitive performance. The aim of this present study is to analyze SD and dose-related effects of Modafinil on spatial cognition according to information processing patterns. Six normal healthy French military personnel participated for 4 one-week testing sessions involving double-blind, placebo-controlled manipulation of three doses of Modafinil (50, 150 and 300 mg/24hrs) during 60 hours of SD. Cognitive tasks investigated spatial abilities. Information

processing data analysis indicates that Modafinil effectiveness is to be qualified based on the dose of Modafinil and psychological processes. Thus, Modafinil has more important beneficial effects on the serial processes which govern the speed of attentive spotlight scanning of the visual field, but a lower effect on the decision making processes involved in the same task. Regarding sensory interactions between vestibular system and vision, low doses (50 et 150 mg/24hrs) of Modafinil have beneficial effects, while a dose of 300 mg/24hrs produces effects which are similar to those observed with a placebo. Lastly, Modafinil have beneficial effects on mental imagery processes, however its effectiveness on mental image accuracy seems to be restricted to 48 hours of SD while vigilance is still well-preserved. This experiment suggest that sensorial integration processes, working memory and control operators are the preference target site for SD and Modafinil.

Author

*Central Nervous System Stimulants; Information Processing (Biology); Mental Performance; Sleep Deprivation; Cognition; Performance Tests*

19990025681 Naval Action Force, Toulon, France

**Slow Release Caffeine: A Valid Pharmacological Countermeasure**

Sicard, B., Naval Action Force, France; Lagarde, D., Centre d'Enseignement et de Recherches de Medecine Aeronautique, France; Batejat, D., Centre d'Enseignement et de Recherches de Medecine Aeronautique, France; Chauffard, F., Nestle Research Centre, Switzerland; Enslin, M., Nestle Research Centre, Switzerland; Tachon, P., Nestle Research Centre, Switzerland; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Sleep deprivation and desynchronization due to night watch, continuous operations or jet lag induce sleepiness and a decrement in performances: studies have shown that caffeine can be an effective countermeasure in such circumstances. We evaluated a slow release caffeine (SRC), which delays the mean peak plasma concentration and lowers the plasmatic Cmax. Tolerance of 600 mg SRC was assessed in a double-blind, placebo controlled, parallel-group study, involving 120 young adult males. This single dose of SRC was well tolerated by these rested subjects. Pharmacokinetic parameters were not influenced by acetylator status or caffeine use; however calmness and sleep onset were disturbed. Then in another experiment we evaluated in four sessions, 150, 300, 600 mg SRC and a placebo in 24 sleep deprived male and female subjects. Alertness and psychomotor performance were enhanced in both sex. The higher sensitivity to caffeine doses observed in the female group was related to greater susceptibility to sleep deprivation, and to increased salivary caffeine levels correlated with inferior body weight and use of oral contraceptives. Therefore the use of 300 mg SRC by fatigued subjects may significantly improve alertness and performance, with a wider acceptance and tolerance than other psychostimulants like dextroamphetamine.

Author

*Caffeine; Psychomotor Performance; Pharmacology; Countermeasures; Performance Tests; Wakefulness*

19990025682 Centre d'Enseignement et de Recherches de Medecine Aeronautique, IMASSA, Bretigny, France

**Cognitive Performance During a 64-Hours Sleep Deprivation: Interest of a Slow Release Caffeine** *Performances Cognitives de Sujets Soumis a une Privation de Sommeil Totale de 64 Heures: Interet d'une Forme a Liberation Prolongee de Cafeine*

Doireau, P., Centre d'Enseignement et de Recherches de Medecine Aeronautique, France; Batejat, D., Centre d'Enseignement et de Recherches de Medecine Aeronautique, France; Chauffard, F., Nestle Research Centre, Switzerland; Enslin, M., Nestle Research Centre, Switzerland; Tachon, P., Nestle Research Centre, Switzerland; Pradella, S., Centre d'Enseignement et de Recherches de Medecine Aeronautique, France; Lagarde, D., Centre d'Enseignement et de Recherches de Medecine Aeronautique, France; September 1998; 12p; In French; See also 19990025670; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Sleep deprivation is a consequence of modern military warfare. It leads to mental and physical performance decrement. Historically, psychostimulants have been widely used in the military context. Among them, caffeine is the most commonly taken, thus not prescribed, substance to cope with fatigue. Caffeine increases the level of alertness and the cognitive performance of fatigued personnel. Nevertheless, this effect is transitory and leads to chronic consumption and well known side effects. Recently, a slow release (SR) caffeine has been designed by NESTEC to improve its usability in sleep deprivation context. We present some data of an experiment conducted to answer the two following questions: 1) is SR caffeine an effective substance to maintain a good level of alertness during a 64-hours sleep deprivation?; and 2) is it able to alleviate the performance decrement of subjects? We will focus here on the results of the last objective.

Author

*Caffeine; Alertness; Mental Performance; Sleep Deprivation; Performance Tests; Cognition*

19990025685 Universidad Complutense, Dept. of Physiology, Madrid, Spain

**Urinary Melatonin Excretion in Airline Pilots Submitted to Transmeridian Flights**

Tresguerres, J., Universidad Complutense, Spain; Ariznavarreta, C., Universidad Complutense, Spain; Granados, B., Universidad Complutense, Spain; Martin, M., Universidad Complutense, Spain; Villanua, M. A., Universidad Complutense, Spain; Golombek, D., Universidad Complutense, Spain; Cardinali, D. P., Buenos Aires Univ., Argentina; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Endogenous biological circadian rhythms are present in the majority of behavioural and physiological variables of all living organisms. These rhythms are entrained to the external environment in which they live, and get desynchronized as a consequence of transmeridian flights. This study has investigated changes occurring in various biological markers in air line pilots during and after westbound (Madrid-Mexico) and eastbound (Madrid-Tokyo) flights. The results have been compared to those of a non flying control group over a 6 day period. A clear cut activity rhythm adapted to the local "Zeitgeber" was present over the whole period in controls as well as an evident rhythm in the urinary excretion of 6 sulfatoxy melatonin. Pilots showed alterations of the melatonin rhythm already on the day before of the flight, probably due to the desynchronizing effects of previous transmeridian flights. to Mexico, the rhythm remained adapted to Madrid in the first day and started to get adjusted to local time the second day. Pilots older than 50 years showed a higher resistance to change their excretory rhythm, to adjust to the local environment. The return flight to Madrid occurred in the middle of maximal 6 sulfatoxy melatonin excretion. Experimental subjects flying to Tokyo showed a complete disruption of the hormonal excretory, and of the activity rhythms. All subjects showed tiredness and anxiety at the end of the flights, being at a maximum when arriving to Tokyo. Pilots did not completely recover before the return flight.

Author

*Aircraft Pilots; Hormones; Circadian Rhythms; Jet Lag; Desynchronization (Biology); Flight Stress (Biology); Human Performance; Physiological Effects*

19990025686 Army Aeromedical Research Lab., Fort Rucker, AL USA

**Aviator's Grounding Time After Melatonin Administration During Rapid Deployment Missions**

Comperatore, Carlos A., Army Aeromedical Research Lab., USA; Wright, Darlene, Army Aeromedical Research Lab., USA; Day-Clayton, Melanie, Army Aeromedical Research Lab., USA; Riuvera, Pik, Army Aeromedical Research Lab., USA; Bey-Wright, Regina, Army Aeromedical Research Lab., USA; Kirby, Albert W., Universal Energy Systems, Inc., USA; September 1998; 10p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The determination of drug-induced grounding time for aviation personnel can be derived from the drug's half-life, the assessment of hangover effects, and the evidence that sleep, alertness, and cognitive functions are normal some time after administration. Melatonin's half-life has been reported at approximately 60 minutes. Its side effects, particularly in the case of low doses no greater than 1 mg, generally are limited to drowsiness during the first 2 h after administration. This would imply that grounding time would be minimal for regimens employing 1 mg or less. However, the use of melatonin in rapid military deployments depends upon the development of regimens which can induce large advances or delays of circadian rhythms in relatively short periods of time (1-2 days).

Derived from text

*Circadian Rhythms; Hormones; Aircraft Pilots; Pilot Performance; Half Life*

19990025687 Force d'Action Navale, Toulon, France

**Zolpidem, Sleepiness and the Psychomotor Capacities of Ground Personnel and Pilots *Zolpidem, Vigilance et Capacites Psychomotrices de Personnels au Sol et de Pilotes***

Sicard, B., Force d'Action Navale, France; September 1998; 6p; In French; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

During extended operations, crews often suffer from fatigue linked to rest periods that are quantitatively or qualitatively insufficient. These episodes of sleep deprivation are caused by many factors: workload, desynchronization during deployments across several time zones or during repeated night missions (or flying the latter exclusively), inadequate environmental sleep conditions (noise, extreme temperatures), excitability due to operations and combat stress. The use of soporifics is one of several means for optimizing crew rest periods. The ideal soporific for this purpose should be able to induce rapidly a period of sleep that is equal in quality to approximately 5 hours of physiological sleep and has no residual effects upon awakening, even for complex tasks such as pilotage.

Derived from text

*Sleep Deprivation; Psychomotor Performance; Pilots; Ground Crews; Workloads (Psychophysiology); Sleep*

19990025688 Royal Air Force, Personnel and Training Command, Gloucester, UK

**Operational Determinants of Medical Planning**

Gibson, T. M., Royal Air Force, UK; September 1998; 6p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Aeromedical evacuation is but one stage of medical treatment for surviving casualties of a military operation. Planning for aeromedical evacuation must take account of the overall medical estimate. This paper describes the factors that medical staffs have to take into account during the planning stage of military operation and draws attention to some of the lessons learned from recent operations.

Derived from text

*Medical Services; Aerospace Medicine; Operational Problems; Evacuating (Transportation); Casualties*

19990025689 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

**Casualty Care for 2010 and Beyond**

Hersack, Richard A., Air Force Medical Center, USA; Carlton, Paul K., Jr., Air Force Medical Center, USA; Farmer, Chris, Air Force Medical Center, USA; September 1998; 24p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper discusses the priorities from medical readiness which include: (1) provide "essential" care forward, i.e. switch from "definitive" care forward with emphasis on casualty prevention; (2) critical care capable evacuation system; (3) modularize deployable medical units.

Derived from text

*Casualties; Prevention; Health*

19990025690 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

**Experiences of the Critical Care Air Transport Teams (CCATT) During Operation Joint Endeavor**

Hersack, Rick, Air Force Medical Center, USA; Lawlor, Dennis, Air Force Medical Center, USA; Carlton, P. K., Jr., Air Force Medical Center, USA; Beninati, William, Air Force Medical Center, USA; Grissom, Thomas, Air Force Medical Center, USA; Morales, Carlos, Air Force Medical Center, USA; Derdak, Stephen, Air Force Medical Center, USA; Farmer, J. Christopher, Air Force Medical Center, USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

For the past year, Critical Care Air Transport Teams (CCATT's) from Keesler Medical Center, Keesler AFB, Mississippi and Wilford Hall Medical Center, Lackland AFB, Texas have been deployed to support Operation JOINT ENDEAVOUR (OJE), the NATO peace effort in Bosnia. This is the largest operation involving the use of the CCATT's to date. A CCATT consists of a physician specializing in intensive care medicine, a critical care nurse, and a cardiopulmonary technician. The CCATT uses transport monitors, ventilators, portable blood analyzers and other medical equipment commonly used in our medical centers' intensive care units. The CCATT augments the standard aeromedical evacuation aircrew so that critically ill or injured patients may be evacuated from forward areas to definitive care hospitals. Otherwise, field hospitals in forward areas would have to provide care for these patients until they were stable enough to travel unaccompanied, creating huge logistical demands, or provide a physician to accompany the patient during evacuation, leaving forward field hospitals understaffed. Providing increased clinical capabilities aboard patient evacuation flights is not new. Several other nations' military medical services have extensive experience using enroute care providers to manage critically ill or injured patients during evacuation. During one year of the OJE deployment, the CCATT's moved 44 patients in 42 missions. Of these patients, 22 required mechanical ventilation during the flight. Eight missions were transatlantic flights to return patients to treatment facilities in the USA. CCATT's also redeployed to support the evacuation of foreign nationals from Liberia and rescue operations after the Khobar Towers Bombing in Dhahran. With the end of the "Cold War", a shift in military medical planning now calls for a reduced medical presence in areas of conflict and a subsequent increased reliance on patient movements out of theater for definitive medical and surgical care. The CCATT concept is an effective solution that fills the need for long range critical care air evacuation and easily integrates into the current aeromedical evacuation system.

Derived from text

*Air Transportation; Patients; Medical Services; Military Operations; Rescue Operations*

19990025691 Aeromedical Evacuation Squadron (0043rd), Pope AFB, NC USA

**Evolving Doctrine in the Theater Aeromedical Evacuation System (TAES): Operation JOINT ENDEAVOR/GUARD and Beyond**

Miller, P. M., Aeromedical Evacuation Squadron (0043rd), USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

With an increase in contingency operations in the NATO theater of operations, the Theater Aeromedical Evacuation System (TAES) needs to be flexible to meet the ever-changing demands of both combat operations and military operations other than war. Recent evolution in USA medical evacuation policies have made it necessary for the TAES to also change the way it does business. This paper discusses the composition of the TAES, recent additions to the TAES, trends in US medical policies, and implementation of the TAES during Operation JOINT ENDEAVOR/GUARD.

Derived from text

*Medical Services; Evacuating (Transportation); Military Operations; Air Transportation*

19990025692 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

**The Mobile Field Surgical Team (MFST): A Surgical Team for Combat Casualty Care in the Information Age**

Carlton, P. K., Air Force Medical Center, USA; Pilcher, John, Air Force Medical Center, USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The current military medical system is designed to support 20th century combat: the forces involved in the conflict were large, powerful, and ponderous. Medical planning for conflicts such as these included several assumptions about the conditions involved (1) Discrete build-up phase - medical units would have time to assemble their assigned personnel and materials, and would be permitted to set up these facilities before use of the facilities would be required; (2) Large number of casualties; (3) Definitive care in theater - lines of battle were fairly stable; thus injured personnel would be treated in-theater until they reached a convalescent phase. At that point they would be returned to duty or evacuated from the theater; and (4) Traditional evacuation system - the Air Evacuation system would serve to transport patients who had been injured, but had essentially no ongoing requirements for medical care. The assets that were developed to meet the medical needs of these conflicts (the Air Transportable Hospital (ATH), Combat Support Hospital (CSH), and Fleet Hospital) are very capable and offer a variety of medically oriented services. They are essentially full-service hospitals packaged in a format that can be moved by air or sea. As full-service hospitals, they are quite large and heavy, and they require a significant amount of time and space to set up. The ATH (for example) is intended to be deployed in a modular or "building block" fashion, but this is implemented by bringing primary care capability into the theater first. Thus a full 50-bed ATH is necessary before trauma surgery or even an appendectomy can be performed. This set of equipment is packaged on 52 pallets, requiring airlift of seven C-141 aircraft.

Derived from text

*Surgery; Support Systems; Air Transportation; Casualties; Deployment*

19990025693 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

**The Provision of Intensive Care Medicine in Austere Field Locations**

Farmer, J. Christopher, Air Force Medical Center, USA; Carlton, P. K., Jr., Air Force Medical Center, USA; Kilpatrick, Russell, Air Force Medical Center, USA; Derdak, Steven, Air Force Medical Center, USA; Hersack, Richard, Air Force Medical Center, USA; Morales, Carlos, Air Force Medical Center, USA; King, Jim, Air Force Medical Center, USA; Ramon, Jose, Air Force Medical Center, USA; Beninati, Bill, Air Force Medical Center, USA; Grissom, Thomas, Air Force Medical Center, USA; Lawlor, Dennis, Air Force Medical Center, USA; Guz, Evan, Air Force Medical Center, USA; Biggers, Butch, Air Force Medical Center, USA; September 1998; 5p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Technologic advances have made laboratory testing feasible at the bedside. Point-of-care testing (POCT) allows medical providers to assess a wide range of clinical conditions in a rapid fashion at the site of patient interaction. While POCT has begun to impact on the delivery of care in the hospital setting, its potential for use in remote, field environments or during aeromedical evacuation is just being realized. In the civilian setting, discussion of POCT focuses on regulatory guidance, cost effectiveness, and reimbursement. Little attention has been paid in the literature to expanding the use of these capabilities beyond the traditional hospital boundaries. In this paper, we will briefly review the development of POCT and the associated technology. In addition, we will discuss the potential role of POCT in the field using current technology. Finally, we will review the available literature on use of POCT in the field.

Derived from text

*Evacuating (Transportation); Medical Services; Cost Effectiveness; Air Transportation*

19990025694 School of Aerospace Medicine, Brooks AFB, TX USA

**Point-of-Care Testing: Can it be Adapted for the Field Environment?**

Grissom, Thomas E., School of Aerospace Medicine, USA; Lawlor, Dennis, Air Force Medical Center, USA; September 1998; 6p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Technological advances have made laboratory testing feasible at the bedside. Point-of-care testing (POCT) allows medical providers to assess a wide range of clinical conditions in a rapid fashion at the site of patient interaction. While POCT has begun



to impact on the delivery of care in the hospital setting, its potential for use in remote, field environments or during aeromedical evacuation is just being realized. In the civilian setting, discussion of POCT focuses on regulatory guidance, cost effectiveness, and reimbursement. Little attention has been paid in the literature to expanding the use of these capabilities beyond the traditional hospital boundaries. In this paper, we will briefly review the development of POCT and the associated technology. In addition, we will discuss the potential role of POCT in the field using current technology. Finally, we will review the available literature on use of POCT in the field.

Author

*Medical Services; Field Tests; Medical Equipment*

19990025695 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

**Use of Point of Care (POC) Laboratory Devices by Critical Care Air Transport Teams (CCATT) of the USA Air Force**  
Lawlor, Dennis, Air Force Medical Center, USA; Grissom, Thomas, School of Aerospace Medicine, USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Point of Care (POC) laboratory devices have recently been utilized in medical centers to provide rapid results at the bedside of critically ill patients. The locations most commonly targeted are the Intensive Care Unit, the Operating Room, the Recovery Room and the Emergency Room. The impetus to use these devices is to provide immediate, accurate results of several critical laboratory values, especially those values that can change quickly. Instruments that can measure pCO<sub>2</sub>, pO<sub>2</sub>, pH, hemoglobin, hematocrit, sodium, potassium, chloride, glucose, urea, and ionized calcium and provide results in several minutes are already available. Technological requirements for a POC device include being small (less than 10 pounds), use small quantities of blood, can use AC or DC current, and require a minimum of effort to calibrate.

Derived from text

*Air Transportation; Potassium Chlorides; Sodium Chlorides; Emergencies; Patients; Hemoglobin; Glucose; Hematocrit*

19990025696 Walter Reed Army Inst. of Research, Div. of Surgery, Washington, DC USA

**Life Support for Trauma and Transport (LSTAT(trademark)): A NATO Litter-Based Critical Care Transport Platform**  
Pearce, F. J., Walter Reed Army Inst. of Research, USA; Wiesmann, W. P., Army Medical Research and Materiel Command, USA; Hale, J., Armstrong Lab., USA; Licina, J. R., Army Aeromedical Research Lab., USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

A significant portion of the military field medical footprint is currently consumed by post surgical patients, which according to current doctrine, must be stable before evacuation. This requirement results in a significant logistical burden for our ground forces. At present, we do not have adequate monitoring or therapeutic capabilities during ground or air transport to a definitive care treatment facility. In response to this need, we initiated a research and development activity to design and build a NATO-stretcher-based mini-intensive care unit that incorporates resuscitative and life-sustaining capabilities for field surgery and en route care. The LSTAT(trademark) has 3 basic components: (i) the base unit; (ii) a NATO stretcher; and (iii) a canopy that covers the entire patient. The LSTAT(trademark) base contains medical, diagnostic and therapeutic components while medical parameters, system performance data and user interactions are continuously monitored and logged by an on-board CPU. Provision is made for storage of up to 36 hours of physiologic and system performance data which can be uploaded to a local or remote host computer. When necessary, this data can also be communicated to the receiving hospital during evacuation for review by physicians to aid in their medical preparations for treatment. This facility provides a new life support capability for transport of marginally stable or unstable patients which integrates with existing NATO evacuation platforms.

Derived from text

*Life Support Systems; Air Transportation; Physiology; Diagnosis; Surgery*

19990025697 Defence and Civil Inst. of Environmental Medicine, Operational Human Engineering Group, North York, Ontario Canada

**An Integrated Medical Monitor for Aeromedical Use**

Dyck, W. R., Defence and Civil Inst. of Environmental Medicine, Canada; Nichols, A., CME Telemetry, Inc., Canada; September 1998; 8p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

As early as 1973, the Canadian Forces Medical System realized that medical monitoring of a casualty in the field, in the presence of an NBC threat, is very difficult. More recently, during the Gulf War, this deficiency was again addressed. A Canadian Forces (CF) requirement was written for a portable, integrated system for monitoring the vital signs of patients in the field, under adverse, unconventional conditions. Design considerations of such a device included that it be rugged, battery operated, easy to use, and yet be accurate enough to be useful as a monitoring tool. A project began, within the Canadian research and development branch, to identify existing technologies, to perform a feasibility study of developing the technology internally, and then to develop

a vital signs monitor, if economical to do so. A CF version of a vital signs monitor was developed, and the technology was transferred to industry. The device, VITSEM 200 produced by CME Telemetry, is described, and available for demonstration. The VITSEM 200 can be used to monitor heart rate, body temperature, and blood oximetry continuously, and blood pressure when required. It measures 14.7 x 9.3 x 5.4 cm and weighs approximately 390 g. A version of the device (less the blood oximetry capability) has been evaluated successfully in a simulated NBC environment, and in a helicopter - deemed to be two of the most demanding adverse scenarios. The VITSEM 200 is currently being acquired by the Department of National Defence in sufficient quantities for user evaluations. If the user evaluations are successful, it is anticipated that the VITSEM 200 will become a new and valuable tool within all the medical elements of the CF.

Derived from text

*Aerospace Medicine; Casualties; Oximetry; Patients; Warfare*

**19990025698** Department of the Air Force, Nurse Corps, Brooks AFB, TX USA

#### **Spinal Cord Injury Transport System**

Mason, Barbara-Marie, Department of the Air Force, USA; September 1998; 2p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The USA Air Force Air Mobility Command (AMC) is tasked to provide the aeromedical evacuation of casualties in routine and contingency operations. To carry out this mission, AMC needs a medical support system suitable for transporting patients with spinal cord injuries and all types of extremity and cervical traction requirements. This piece of equipment would be a Spinal Cord Injury Transport System (SCITS). The current method for transporting these patients is on the Stryker Turning Frame with a Collins Traction Device, for cervical traction. The system has been in use for over 20 years and is no longer logistically supported and must be replaced. The replacement system should provide a quality of care comparable to that available in fixed (ground) medical treatment facilities; i.e., a system that provides traction and kinetic therapy through incremental side-to-side rotation. Although SCITS will primarily be used for the previously mentioned patients, it would be beneficial and used for a variety of other patient conditions such as multiple trauma, burns, chest wounds, pulmonary complications, and post operative, depending on availability.

Derived from text

*Spinal Cord; Injuries; Air Transportation; Evacuating (Transportation); Medical Services; Support Systems; Casualties*

**19990025699** Department of the Air Force, Nurse Corps, Brooks AFB, TX USA

#### **Advanced Hybrid Oxygen System-Medical**

Mason, Barbara-Marie, Department of the Air Force, USA; September 1998; 2p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

In 1993, a human system need request was submitted by Air Mobility Command to the Human Systems Center Plans and Program Office. This document tasked the aeromedical systems division to determine the feasibility of a hybrid oxygen system that could support the flight crew, patients and passengers on board an aircraft. What is currently available for flight crew is a variety of oxygen systems. There are liquid oxygen (LOX) systems, gaseous oxygen and onboard oxygen generating systems. The Patient Therapeutic LOX system is currently used for the patient therapeutic oxygen and passenger supplemental oxygen onboard some aeromedical evacuation aircraft. The limitations of existing onboard oxygen generating systems are they are not capable of generating or storing sufficient oxygen to meet patient and passenger needs.

Derived from text

*Aerospace Medicine; Oxygen Supply Equipment; Liquid Oxygen; Air Transportation; Evacuating (Transportation); Flight Crews; Medical Services*

**19990025700** School of Aerospace Medicine, Brooks AFB, TX USA

#### **Mechanical Ventilator Performance During Aeromedical Evacuation**

Grissom, Thomas E., School of Aerospace Medicine, USA; Papier, Kenneth S., Air Force Medical Center, USA; Lawlor, Dennis, Air Force Medical Center, USA; Farmer, J. Christopher, Air Force Medical Center, USA; Derdak, Stephen, Air Force Medical Center, USA; September 1998; 8p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Current USA military medical planning calls for a decreased medical presence in areas of conflict with increased reliance on patient movements out of theater for more definitive medical and surgical care. As a result, the aeromedical evacuation system will be moving patients with critical conditions and injuries faster and further than during past contingencies. This will include the movement of an increasing number of patients requiring mechanical ventilatory support. Advances in ventilator technology have led to the introduction of smaller and more capable transport ventilators. Some of these ventilators use built in air compres-

sion devices which remove the necessity of carrying an external compressor. In addition, manufacturers have incorporated newer modes of ventilation to improve patient tolerance of mechanical ventilation and provide the user with route care capability for the critically injured or ill patient.

Derived from text

*Ventilators; Oxygen Consumption; Military Operations; Evacuating (Transportation); Air Transportation; Medical Services*

19990025701 Militair Hospitaal Dr. A. Mathijssen, Utrecht, Netherlands

**The Use of Ultrasound in Military Traumatology**

vanDalen, Albert, Militair Hospitaal Dr. A. Mathijssen, Netherlands; September 1998; 6p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

In the last decade ultrasound (US) has become a very important diagnostic tool in many areas of medicine, including traumatology. US is a reliable method to detect blood in the peritoneum. When a modern system and a skilled examiner are available the invasive diagnostic abdominal tap has become obsolete. Also hemothorax and hemopericard are easily diagnosed with US and diagnostic or evacuating puncture can safely be performed under US guidance. US can also evaluate organ damage, in particular of peripheral anatomical structures. It may guide interventional procedures and is very helpful in the detection of foreign bodies, not visible on conventional radiographs. For these reasons 21 portable US systems were purchased by the Netherlands armed forces in 1993, intended for use- next to X-ray equipment - in field hospitals with operating room facilities. Practical experience with the US systems was obtained during two years of "peacekeeping" activities in former Yugoslavia. Due to modern technology a further reduction in size with development of one hand hold systems with good imaging qualities will soon be realised. This allows US examination of injured patients on the battlefields. In case of many victims and limited capacities US may play an important role in triage.

Derived from text

*Radiography; Imaging Techniques; Peritoneum; Blood; Ultrasonics*

19990025702 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

**Trauma Surgery for Contingency Operations: Test Based Improvements**

Carlton, P. K., Air Force Medical Center, USA; Putnam, A. Tyler, Air Force Medical Center, USA; Bradley, Donald, Air Force Medical Center, USA; Coopwood, Joseph, Air Force Medical Center, USA; Pilcher, John, Air Force Medical Center, USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

This paper describes work undertaken at Wilford Hall Medical Center for testing and quantification of practice changes planned to facilitate the concept of "forward resuscitative surgery." This paper will begin by discussing the rationale for and composition of the Mobile Field Surgical Team (MFST). It will then proceed to discuss the challenges that arose in the formation of the team and its concepts of operation, with a description of several areas in which we have performed objective testing of the proposed new practices. I will describe our evaluation of the following areas: (1) instrument disinfection technique that does not use an autoclave; (2) live surgery using a pared-down equipment package; (3) trauma surgery without visible light; and (4) possible application of thermal imaging to commonplace medical care

Derived from text

*Surgery; Procedures; Antiseptics; Thermal Mapping*

19990025703 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

**Temporary Arterial Shunts for Management of Major Extremity Arterial Injury: A Field Expedient Bridge to Definitive Surgical Reconstruction**

Dawson, David L., Air Force Medical Center, USA; Light, Jerry T., Air Force Medical Center, USA; Putnam, A. Tyler, Air Force Medical Center, USA; Kissinger, David P., Air Force Medical Center, USA; Bradley, Donald V., Air Force Medical Center, USA; September 1998; 8p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Shunts were successfully placed and patency maintained 24 hours in all 8 animals. Shunt malposition with subsequent thrombosis requiring thrombectomy and repositioning occurred in one pig during the 4th hour of the experiment; this was successfully corrected and the shunt remained patent throughout the remainder of the experiment. Flow data from two animals was not able to be analyzed-one developed malignant hyperthermia which caused a hyperdynamic state, skewing the data; and the second had incomplete flow data due to equipment malfunction. This graph depicts the flow data comparing the control and shunted limbs. Although the flow through the shunted limbs was significantly lower than that of the non-shunted ones ( $p = 0.0015$ ), the shunted

limbs remained warm and well-perfused without any clinical evidence of ischemia. Flow rates did not differ significantly over time in either the shunted or control limbs.

Derived from text

*Arteries; Hyperthermia; Thrombosis; Surgery; Flow Velocity; Bypasses*

19990025704 Hemosol, Inc., Etobicoke, Ontario Canada

**Blood Substitutes in Contingency Operations**

Magnin, Anthony A., Hemosol, Inc., Canada; Carmichael, F. J. Lou, Hemosol, Inc., Canada; September 1998; 8p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

For many years there has been a concerted effort by both industry and the military to develop blood substitutes. Such products are expected to be well-suited for use in emergency/trauma settings where the timely provision of fully cross-matched blood for resuscitation and/or transfusion may be difficult and prohibitively expensive. The use of cell free hemoglobin solutions as a safe and effective adjunct or alternative to red blood cell transfusion has long intrigued and challenged medical practitioners dealing with the various aspects of trauma, elective and emergency surgery, and other branches of medicine. Interest in this field has been heightened by concerns of the safety of blood and blood products, particularly in terms of possible contamination with infectious agents. There are still concerns about transmission of blood-borne diseases during the "window period" when infectious agents may be present, but antibodies are not yet detectable in blood using current methods. In addition, the incidence of immune suppression, occasional accidental mismatching of blood and recipient, and the extent of both major and minor reactions associated with blood transfusion continue to cause concern.

Derived from text

*Blood; Hemoglobin; Resuscitation; Contingency; Surgery; Cells (Biology)*

19990025705 Ministry of Defence, Direzione Generale della Sanita Militare, Rome, Italy

**A Worldwide Epidemiological Survey on the Infrastructure for Prevention of Communicable Diseases in the Military**  
dAmelio, R., Ministry of Defence, Italy; Heymann, D. L., World Health Organization, Switzerland; September 1998; 6p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Infectious diseases represent a heavy burden for mankind. In 1995 infectious diseases were responsible for more than 17 million (33%) of nearly 52 million deaths worldwide. Among these infectious diseases, 65% were those characterized by person-to-person transmission, such as the sexually and air-borne transmitted diseases, followed by food, water and soil-borne (22%), insect-borne (13%) and animal-borne (0.3%) diseases. They include, in order of importance, acute respiratory infections (4.4 million deaths/year), followed by diarrhoeal diseases (3.1 million deaths/year), tuberculosis (3.1 million deaths/year) malaria (2.1 million deaths/year), hepatitis B (1.1 million deaths/year), HIV/AIDS (greater than 1 million deaths/year), neonatal tetanus (500,000 deaths/year), whooping cough (355,000 deaths/year) and lastly roundworm and hookworm (165,000 deaths/year)

Derived from text

*Infectious Diseases; Epidemiology; Prevention; Parasitic Diseases; Surveys*

19990025706 Joint United Nations Programme on HIV/AIDS, Geneva, Switzerland

**Prevention of HIV Infection and Sexually-Transmitted Diseases in Contingency and Peacekeeping Operations**

Kingma, Stuart J., Joint United Nations Programme on HIV/AIDS, Switzerland; September 1998; 6p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Armed forces personnel are at special risk for exposure to STDs and HIV. The HIV risks are related to sexual activity and injecting drug use, and they are much higher during deployment. Military readiness can be compromised by these diseases through sick leave, loss of training input, loss of experience/skills, and cost of replacement training. HIV-positive personnel jeopardise field safety of blood supplies during contingency operations. Providing first aid in the field is also more complicated, and interaction with the local population carries its special risks.

Derived from text

*Infectious Diseases; Risk; Prevention*

19990025707 Zurich Univ., Div. of Epidermiology and Prevention of Communicable Diseases, Switzerland

**Priorities in Immunizations for Peacekeeping Forces**

Steffen, Robert, Zurich Univ., Switzerland; September 1998; 8p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Previous experience shows wide differences in the immunizations status among contingents arriving from different nations for peacekeeping missions. This seems to be due to lack of knowledge, lack of coordination, and lack of financial support. to obtain

logical priorities for immunizations in peacekeeping forces, one must primarily assess the risk of infection, to a lesser degree consider the impact of infection. Host factors, legal aspects and vaccine safety and efficacy also play a role. Usually, peacekeeping missions take place in regions with impaired hygienic conditions, in non-immunes, the risk is greatest for hepatitis A, hepatitis B, typhoid fever and measles in most countries. Yellow fever, Japanese encephalitis, poliomyelitis, and plague are of no concern at many destinations, but the risk may be substantial at others. Cholera, diphtheria, rabies, tetanus and tuberculosis are a lesser, albeit almost worldwide risk for troops. Depending on the type of mission, immunization against influenza needs to be considered. Future oral vaccines against gastrointestinal infections may become relevant issues in the near future.

Author

*Immunology; Infectious Diseases; Vaccines; Priorities; Risk; Safety*

19990025708 School of Aerospace Medicine, Flight Medicine Branch, Brooks AFB, TX USA

**Compliance with Anti-Malarial Preventive Measures by Deploying USAF Personnel for Operation Assured Response**  
Williams, Christopher S., School of Aerospace Medicine, USA; Aeromedical Support Issues in Contingency Operations; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The results of this study also indirectly suggest that reducing exposure in-country is a very important factor. If keeping personnel indoors can be accomplished, mosquito bite exposure, especially during evening hours when they are most active in feeding, would be beneficial. If sleeping indoors is accomplished with the issuance and proper use of mosquito netting.

Derived from text

*Military Operations; Exposure; Insects; Nets*

19990025709 Army Medical Research Inst. of Infectious Diseases, Operational Medicine Div., Fort Detrick, MD USA

**Air Evacuation Under High-Level Biosafety Containment: The Aeromedical Isolation Team**

Christopher, George W., Army Medical Research Inst. of Infectious Diseases, USA; Eitzen, Edward M., Jr., Army Medical Research Inst. of Infectious Diseases, USA; September 1998; 10p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Contingency operations in tropical environments and the potential use of biological weapons by adversaries place troops at risk for potentially lethal contagious infections. Examples include viral hemorrhagic fevers, plague, and zoonotic poxviruses. Rapid diagnosis and basic research regarding countermeasures for such illnesses would be facilitated by evacuating a limited number of patients to a facility with containment laboratories. In order to safely evacuate such patients to our institute via military aircraft and to minimize the risk of transmission to air crews, care givers, and civilian communities, the U.S. Army Medical Research Institute of Infectious Diseases has developed an Aeromedical Isolation Team (AIT). The AIT is a rapid response team with worldwide airlift capability designed to evacuate and manage patients under high level containment. Teams consist of a physician, a registered nurse, and four to six medics. The teams are accompanied by a fully functioning diagnostic laboratory utilizing genetic typing methods and immunoassays. Protective equipment includes impermeable protective suits equipped with powered HEPA-filtered respirators and patient isolators equipped with negative-air pressure, HEPA-filtered ventilation system. Technical aspects of AIT equipment, training, deployments, and capabilities are discussed.

Derived from text

*Aerospace Medicine; Infectious Diseases; Viruses; Medical Science; Flight Crews*

19990025711 Military Satellite Command, Command and Control Systems Electronic Systems Center, Hanscom AFB, MA USA  
**Evolution of a Global Military and Civilian Telemedicine Network for the 21st Century: Near Future on Demand, Space Based Delivery of Multimedia Services**

Evans, John A., Military Satellite Command, USA; Davidson, Frank, Massachusetts Inst. of Tech., USA; Sanders, Jay, American Telemedicine Association, USA; McInerney, Thomas G., Business Executives for National Security, USA; Brandon, William T., Mitre Corp., USA; Row, Lockard M., Row (Lockard M.), USA; September 1998; 22p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper stresses the more recent intraregional telemanagement and telemedicine efforts and synthesizes key success factors essential for evolving self-sustaining global telemanagement and telemedicine networks for the twenty-first century. Finally, future directions are proposed which could adapt these kinds of networks to bring about healthier military and civilian communities.

Derived from text

*Telemedicine; Biotelemetry; Medical Electronics; Teleconferencing; Telecommunication; Military Operations*

19990025712 Army Medical Research and Development Command, Telemedicine and Advanced Technology Research Center, Fort Detrick, MD USA

**Telemedicine in Support of Operations in Remote Locations**

Morris, Tommy, Army Medical Research and Development Command, USA; Vandre, Robert H., Army Medical Research and Development Command, USA; Rocca, Mitra, Army Medical Research and Development Command, USA; Roller, Jeffrey I., Army Medical Research and Development Command, USA; Salisbury, Timothy, Army Medical Research and Development Command, USA; September 1998; 1p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

USA military services deploy to isolated locations with integral medical support. In most small deployments the unit has a General Medical Officer and/ or a Physician's Assistant as well as a compliment of Medics to provide primary medical care to the assigned personnel. The goal of telemedicine is increase the quality of care given to the soldiers by providing access to specialty providers utilizing satellite communications and commercial off the shelf technologies.

Derived from text

*Telemedicine; Deployment; Medical Science; Medical Equipment; Medical Electronics; Biotelemetry*

19990025713 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

**The Potential Uses of Telemedicine to Augment Critical Care In-the-Air**

Farmer, J. Christopher, Air Force Medical Center, USA; Carlton, P. K., Jr., Air Force Medical Center, USA; Kilpatrick, Russell, Air Force Medical Center, USA; Derdak, Steven, Air Force Medical Center, USA; Beninati, Bill, Air Force Medical Center, USA; Grissom, Thomas, Air Force Medical Center, USA; September 1998; 3p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Recent advances have allowed us to expand the realm of intensive care medicine into the aeromedical evacuation arena. The rate limiting step to the full scale development of this concept is sufficient numbers readiness directed numbers would not be gainfully employed during a peace time environment. Therefore, we must look to alternate personnel sources to provide this care with sophisticated medical backup. In this regard, telemedicine provides an excellent vehicle to leverage the sophisticated medical care into the hands of other healthcare providers with intensivists backup. Air to ground telemedicine may expand the functionality of available non-physical providers during military medical contingency operations.

Derived from text

*Telemedicine; Military Operations; Medical Services; Air Transportation; Medical Equipment; Teleconferencing*

19990025714 Georgetown Univ., Medical Center, Washington, DC USA

**Light Weight and Portable Telemedicine Workstations: The MUSTPAC Experience**

Macedonia, Christian R., Georgetown Univ., USA; Littlefield, Rik, Georgetown Univ., USA; Eglinton, Gary, Georgetown Univ., USA; Skelly, Larry, Georgetown Univ., USA; September 1998; 3p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Advanced imaging and telecommunications capabilities are becoming commonplace in major university hospitals. The availability of such services to people in remote or deployment environments is not always certain. To address this issue, the US Army and Battelle Memorial Institute developed a family of telemedicine workstations. One device, the MUSTPAC (Medical Ultra-Sound, Three-dimensional and Portable with Advanced Communications) was deployed to the 212th Mobile Army Surgical Hospital in Tuzla, Bosnia-Herzegovina in a feasibility study investigating its potential as a remote diagnostic tool.

Author (revised)

*Telemedicine; Imaging Techniques; Ultrasonics; Military Operations*

19990025715 Air Force Medical Center, Telemedicine Technology Area Directorate, Lackland AFB, TX USA

**StatRad: A Portable Imaging Center for Remote/Hostile Environments**

Freckleton, M. W., Air Force Medical Center, USA; Johnson, Thomas G., Army Medical Research and Materiel Command, USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Until very recently, radiological imaging centers have been restricted to large medical institutions within large, fixed facilities. Although there is no diminution in the need for factors including equipment size, weight, power/water supply, narrow temperature thresholds, etc., have precluded all but the most rudimentary radiological imaging in austere locations. StatRad is an ongoing effort to develop not only imaging equipment, but the components of an integrated and scaleable imaging center for use in circumstances which cannot be controlled for environmental factors, and where the medical response must rapid and decisive.

Derived from text

*Imaging Techniques; Radiology; Image Classification; Image Enhancement; Aerospace Medicine*

19990025716 Militair Hospitaal Dr. A. Mathijssen, Dept. of Radiology, Utrecht, Netherlands

**Teleradiology in the Armed Forces of The Netherlands**

Prins, H. J., Militair Hospitaal Dr. A. Mathijssen, Netherlands; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

In general terms the telemedicine project of the Armed Forces of the Netherlands is described. The system is not suited for use during acute situations in the field with large numbers of casualties. The surgical team will then be busy with life and limb saving procedures. In a later phase the results of the treatment. Problems experienced in the past are discussed. Telemedicine will never be a substitution for medical or surgical expertise in the field.

Derived from text

*Telemedicine; Teleconferencing; Medical Services; Biotelemetry; Substitutes; Armed Forces; Casualties*

19990025717 Mobile Army Surgical Hospital (212th), USA

**Contingency Operations: The Challenging New Paradigm**

Moloff, Alan L., Mobile Army Surgical Hospital (212th), USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

For almost 50 years NATO forces planned and trained for the defence of western Europe. The fall of the Soviet Union and the breakup of the Warsaw Pact has greatly changed the focus of NATO and other military forces is Contingency Operations (CONOPS). This paper will discuss planning factors and considerations for medical support of CONOPS.

Derived from text

*North Atlantic Treaty Organization (NATO); Contingency; Peacetime; Military Psychology; Psychological Effects*

19990025718 Centro de Instruccion de Medicina Aeroespacial, Madrid, Spain

**Stress Factors in the SPAF Personnel Assigned to Humanitarian and Peace Keeping Operations**

Cruz, Jesus Medialdea, Centro de Instruccion de Medicina Aeroespacial, Spain; Tejada, Francisco Rios, Centro de Instruccion de Medicina Aeroespacial, Spain; September 1998; 12p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

In this paper we describe and analyze the stress factors associated to a sample of military personnel currently in flying status, who has been deployed in critical area where a wide range of missions has been conducted. In addition to that, we have studied the adaptation to the possible techniques to minimize such aeromedical issue. In order to evaluate this medical aspects, an interview and survey of factors related to perception of stress has been conducted according to a cognitive model of stress.

Derived from text

*Stress (Psychology); Peacetime; Military Operations; Military Psychology; Psychological Tests; Psychological Effects*

19990025719 National Defence Headquarters, Personnel Research Team, Ottawa, Ontario Canada

**A Conceptual Approach to the Study of Stress in Peacekeeping Personnel**

Murphy, P. J., National Defence Headquarters, Canada; Farley, K. M. J., National Defence Headquarters, Canada; Dobрева-Martinova, T., National Defence Headquarters, Canada; September 1998; 3p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

This paper outlines the current conceptual model utilized in Canadian Forces psychological research of the stress of peace operations. The model incorporates stressor, moderator, outcome and intervention components at the individual, group and organizational levels. Previous research has illustrated many of the various sources of stress on peace operations. Individual and organizational level resources that could serve as moderators of operational stress include individual coping skills, satisfiers of the peacekeeping experience, perceived organizational support and unit climate. Outcome measures include signs and symptoms of stress: both commonplace and more serious stress reactions. Other outcome and intervention components will be explored in future research. This theoretical framework should aid our understanding of the human dynamics of the deployment cycle and suggest appropriate training and interventions to enhance individual and organizational well-being and performance.

Derived from text

*Stress (Psychology); Peacetime; Military Psychology; Psychological Effects; International Cooperation*

19990025720 National Defence Headquarters, Personnel Research Team, Ottawa, Ontario Canada

**Stress in Peace Support Operations: Recent Canadian Experiences**

Murphy, P. J., National Defence Headquarters, Canada; Farley, K. M. J., National Defence Headquarters, Canada; Dubreva-Martino-  
nova, T., National Defence Headquarters, Canada; Gingras, C., National Defence Headquarters, Canada; September 1998; 4p;  
In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The Canadian Forces continues its high profile involvement in peace operations in various parts of the world. At present, over 2000 Canadian Forces personnel are deployed overseas in the peace support roles, largely in Bosnia and Haiti. A long-term research project into the human dimension of operational performance has monitored several aspects of deployments. The paper addresses research findings relating to the stress of peace support operations and other human factors. Select details of significant stressors, the stress-strain relationship and several moderating factors (satisfiers, group cohesion, coping styles and perceptions of organizational support) are presented.

Derived from text

*Military Psychology; Military Operations; Human Performance; Perception; Personnel; Stress-Strain Relationships; International Cooperation*

19990025721 Army of the Czech Republic, SFOR Monitoring Center, Prague, Czechoslovakia

**Motivation Structures of the Czech SFOR Unit Members**

Radova, Jana, Army of the Czech Republic, Czechoslovakia; September 1998; 7p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The Army of the Czech Republic has been actively participating in the peace-keeping missions of the United Nations and NATO from 1991 until today. The goal of this paper is to describe the motivation structures that led our soldiers to participate in the last of the mentioned missions.

Derived from text

*North Atlantic Treaty Organization (NATO); Military Operations; Peacetime; International Law; International Cooperation*

19990025895 Naval Facilities Engineering Service Center, Port Hueneme, CA USA

**Lighterage Seasickness Parametric Study *Final Report***

March, Robert; Palo, Paul; Dec. 1998; 15p; In English

Report No.(s): AD-A358668; NFESC-TM-2306-OCN; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the results of a study performed to estimate seasickness corresponding to several different proposed configurations associated with the Joint Modular Lighterage System (JMLS). Specifically, the dynamic behavior of different modular barges with a heavy load was modeled in a variety of sea state 3 environments. This study consisted of identifying a single representative wave spectrum, running the SCORES vessel dynamics computer model for a variety of conditions (barge size, wave direction and water depth), and comparing the RMS vertical accelerations at various points on the barge deck. A literature survey was completed regarding seasickness criteria, which was then used to convert the RMS accelerations into seasickness potential for varying positions on the vessel.

DTIC

*Computerized Simulation; Dynamic Characteristics; Loads (Forces); Sea States; Spectra*

19990025934 Air Force Research Lab., Human Effectiveness Directorate, Brooks AFB, TX USA

**Testing and Evaluation of the Heartstream, Inc., Model EM Semi-Automatic Defibrillator External *Final Report, Sep. 98***

Sylvester, James C.; Dec. 1998; 17p; In English

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A359533; AFRL-HE-BR-TR-1998-0121; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Heartstream, Inc., Model EM Semi-Automatic External Defibrillator is a portable, battery operated, semi-automatic defibrillator. It performs automatic self-tests and displays the results of these tests on a status indicator. The unit is equipped with a high resolution, liquid crystal display with back light screen that displays text prompts, patient and event information and single-lead electrocardiogram (ECG). The unit operates on a disposable 18 VDC lithium battery. The unit weighs approximately 4.34 lbs. with battery (5.8 lbs. with battery, case and defib pads) and is 8.75 in. W. (10 in. with case) X 2.5 in. H. (4.75 in. with case) X 8 in. D. (9.25 in. with case).

DTIC

*Medical Equipment; Portable Equipment; Battery Chargers; Fibrillation; Electric Batteries; Electrocardiography*



19990025955 Texas Univ., Dept. of Gynecologic Oncology, Houston, TX USA

**Lineage-Negative Human Leukocyte Antigen-DR(+) Cells with the Phenotype of Undifferentiated Dendritic Cells in Patients with Carcinoma of the Abdomen and Pelvis**

Melichar, Bohuslav, Texas Univ., USA; Savary, Cherylyn, Texas Univ., USA; Kudelka, Andrzej P., Texas Univ., USA; Verschraegen, Claire, Texas Univ., USA; Kavanagh, John J., Texas Univ., USA; Edwards, Creighton L., Texas Univ., USA; Platsoucas, Chris D., Texas Univ., USA; Freedman, Ralph S., Texas Univ., USA; Clinical Cancer Research; Mar. 1998; Vol. 4, pp. 799-809; In English; Sponsored in part by American Cancer Society

Contract(s)/Grant(s): NCC9-36; EDT-56; NIH RO1-CA64943; NIH MO1-RR02558; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The characteristics of antigen-presenting cells in carcinomas that involve the abdominopelvic cavity are unknown. Dendritic cells, a population of antigen-presenting cells, have been identified as lineage-negative human leukocyte antigen (HLA)-DR(+) cells by two-color flow cytometry. We used this criterion to study the putative dendritic cells in ascites from 25 patients with peritoneal carcinomatosis. The mean proportion +/-SD of lineage-negative HLA-DR(+) cells in ascites was 3.1 +/- 4.6% (range, 0.05-17.3%). Most lineage-negative HLA-DR(+) cells expressed CD45RA or CD4 antigens. Dendritic cells had low proportions of CD80, CD11c, CD45RO, and CD58, suggesting that they were of low maturity. The proportion of lineage-negative HLA-DR(+) cells in ascites of seven patients was significantly higher than the proportion in peripheral blood from the identical patients (4.5 +/- 5.7 versus 0.5 +/- 0.4; P is less than 0.05). In paired specimens of ascites and peripheral blood, the proportion of lineage-negative HLA-DR(+) cells that coexpressed CD86 or CD58 was significantly lower in ascites than in peripheral blood, whereas a higher proportion of lineage-negative HLA-DR(+) cells in ascites expressed CD4. Relative fluorescence intensity of HLA-DR(+) was also lower in dendritic cells from ascites and blood from patients with carcinomatosis than it was in blood from normal donors. As an indicator of macrophage activation, the concentration of neopterin in ascitic fluid correlated negatively with the numbers of lineage-negative HLA-DR(+) cells in ascites (Spearman correlation coefficient, -0.44; p=0.05) correlated positively with the concentration of interleukin 10 in ascitic fluid correlation coefficient, -0.04; p=0.05). IFN-gamma and tumor necrosis factor alpha were also not detected. These findings suggest that certain factors associated with the tumor microenvironment might influence the number of these dendritic cells and their expression of function-associated markers.

Author

*Leukocytes; Pelvis; Abdomen; Antigens; Cavities; Biological Effects; Cancer*

19990026292 Shock Society, Augusta, GA USA

**Conferences on Shock and Cytokines Final Report, 14 Jun. 1998 - 31 May 1999**

Reichard, Sherwood M.; Dec. 08, 1998; 17p; In English

Contract(s)/Grant(s): N00014-98-1-0691

Report No.(s): AD-A359721; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Summary of Symposia at 21st Annual Conference on Shock held in San Antonio, TX, June 14-17, 1998. Summary of Symposia at 6th International Cytokine Conference held in Jerusalem, Israel, October 20-25, 1999. Both Symposia were very successful. The Attached summaries describe the state of the art scientific progress being made in these vital areas. Also Attached are abstract of all the papers delivered at the symposia.

DTIC

*Conferences; Shock (Physiology); Physiological Responses*

19990026439 Hunter Coll., New York, NY USA

**Exposure of Human Cells to Electromagnetic Fields Final Report**

Henderson, Ann S.; Jan. 01, 1998; 8p; In English

Contract(s)/Grant(s): N00014-90-J-1266

Report No.(s): AD-A359992; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of this research was to find how exposure to extremely low frequency (elf) electric and magnetic fields (EMFs) affects human cells. It was previously postulated that EMFs initiate a transduction cascade at the cell membrane. If this is the case, then within minutes, a sequence of events, including early gene activation, could set up the initial steps leading to proliferation. A series of experiments were set up to determine the validity of this model by measuring specific proteins or protein groups. The results showed that some proteins are increased following exposure to a 60 Hz EMF for periods from 45 to 120 minutes. Other proteins, however, are either decreased or unaffected by the presence of the field.

DTIC

*Cells (Biology); Electromagnetic Fields; Genetics; Exposure*

19990026440 Operational Technologies Corp., San Antonio, TX USA

*Subtle Measurement of Behavior Effects of Microwave Radiation Final Report, Feb. 1994 - May 1996*

Ziriax, John; Nov. 1998; 34p; In English

Contract(s)/Grant(s): F41624-92-D-4001; AF Proj. 7757

Report No.(s): AD-A360020; AFRL-HE-BR-TR-1998-0103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The growing application of microwave (RF) technology has increased the potential for hazardous human exposures. The potential hazard posed by this expanding use of RF technology requires an ongoing study of RF bioeffects to keep pace with new applications and technologies. Furthermore, exposures to new and future sources are likely to involve RF power levels and exposure parameters (e.g., frequency, pulse width, peak power, etc.) which have yet to be studied. Effects on performance are among the most sensitive indices of biological effects and is a necessary part any research program to characterize RF hazards. In addition, many safety issues require understanding potential performance effects. For example, interference with self-rescue or task performance by RF exposure represent two performance mediated hazards.

DTIC

*Microwave Equipment; Radiation Effects; Exposure; Biological Effects; Physiological Effects*

19990026714 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

*Physiological Factors Correlating With a Possible Circadian Nadir in G-Tolerance*

Wright, Bruce A.; Dec. 1998; 79p; In English

Report No.(s): AD-A359903; AFIT-FY99-73; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Circadian variation in athletic performance has been shown to have potentially significant performance consequences for the athlete. This study has attempted to determine whether there is a practical difference between day and night G-tolerance in order to warn pilots of possible adverse consequences due to circadian effects. The subjects' G-tolerance testing times were selected in order to highlight the potential maximum circadian differences. This study leads one to conclude that if there is a circadian effect on a pilot's G-tolerance, it is a small one, or this study would have shown it, and the Air Force should feel more confident to send pilots to fly and fight at night. However, other influences such as lack of sleep and/or extreme levels of stress did seem to have larger effects on pilots' G-tolerance than the proposed circadian effect. Additionally, research on the effect of lighting on suppression of melatonin prior to a nighttime mission should be further investigated.

DTIC

*Circadian Rhythms; Acceleration Stresses (Physiology); Gravitational Physiology; Aerospace Medicine; Gravitational Effects*

## 53

### BEHAVIORAL SCIENCES

*Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.*

19990025332 Oklahoma Univ., Dept. of Psychology, Norman, OK USA

*Situation Awareness as a Predictor of Performance in En Route Air Traffic Controllers Final Report*

Durso, Francis T., Oklahoma Univ., USA; Hackworth, Carla A., Oklahoma Univ., USA; Truitt, Todd R., Oklahoma Univ., USA; Crutchfield, Jerry, Oklahoma Univ., USA; Nikolic, Danko, Oklahoma Univ., USA; Manning, Carol A., Civil Aeromedical Inst., USA; January 1999; 18p; In English

Contract(s)/Grant(s): DTFA02-93-D-93088

Report No.(s): DOT/FAA/AM-99/3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this study, air traffic control instructors controlled simulated traffic while three techniques for determining situation awareness (SA) were implemented. SA was assessed using a self-report measure (SART); a query method that removed information on the plan-view display (SAGAT); a query technique that did not have a memory component (SPAM); and the detection of errors integrated into the scenarios (implicit performance). We used these measures of SA together with a measure of workload, NASA TLX, to predict two different performance measures. One performance measure was an over-the-shoulder, subjective assessment by a subject matter expert (SME). The other performance measure was a count of the number of control actions remaining to be performed at the end of the scenario. The SME evaluation was predicted by workload and the controller's appreciation of both the present and the future. The remaining-actions count (RAC) was predicted by the controller's appreciation of the future. In fact,

an appreciation of the present led to poorer RAC scores: The better the participant was at answering questions about the present or the better he or she understood the present situation, the larger the number of actions remained to be performed. The results have implications for the relationships among workload, situation awareness, and performance, and suggest limitations on several of the measures currently proposed as SA techniques. The results confirm that future versus present is an important conceptual difference in air traffic control. More importantly, the results suggest that a controller who remains overly focused on the present may do so at the expense of the future.

Author

*Air Traffic Control; Simulation; Performance Tests; Air Traffic Controllers (Personnel)*

19990025333 Civil Aeromedical Inst., Oklahoma City, OK USA

**The Role of Shift Work and Fatigue in Air Traffic Control Operational Errors and Incidents** *Final Report*

DellaRocco, Pamela S., Editor, Civil Aeromedical Inst., USA; January 1999; 32p; In English

Report No.(s): DOT/FAA/AM-99/2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report was developed from a collaborative effort between the FAA Civil Aeromedical Institute's (CAMI's) Shift Work and Fatigue Research Program and the National Aeronautics and Space Administration (NASA) Ames Research Center's Fatigue Countermeasures Program. The purpose of this report was to examine existing databases to assess the extent to which shift work and fatigue might be factors associated with incidents and errors in air traffic control (ATC) operations. The first study in this report examined the Aviation Safety Reporting System (ASRS) database, a voluntary reporting system administered and maintained by NASA. The ASRS database was searched for reports concerning ATC incidents. Of the 5773 ATC reports in the database, a search of 19 fatigue-related keywords identified 153 (2.7%) reports referencing controller-related fatigue in the narrative section of the ASRS incident report. These reports spanned the years from 1988 to 1996. These reports were categorized by year of occurrence, aircraft type, fatigue category, incident type, time of day, day of the week, and lighting condition. Controller fatigue was the most commonly identified category in the 153 fatigue-related reports, followed by workload and duty or scheduling factors. Fatigue was reported as a performance-impairing factor affecting personnel at all times of the day, in all types of operations, and manifested itself in a variety of anomalies in ATC operations. The second study in this report examined the Operational Error/Deviation System (OEDS) database, a mandatory reporting system managed and operated by the FAA. A total of 3222 records was examined. These reports spanned the years from 1988 to 1994. The analyses in this study included: (1) descriptive statistics for shift work-related variables; (2) correlations between shift work variables and severity of OEDS; and (3) Chi-square analyses of causal factors and shift type. Frequency counts revealed that 80% of OEDs occurred between 0800 and 1900 and nearly 50% of errors occurred within the first 30 minutes on position, usually upon returning from a break. None of the shift work variables was a strong predictor of the severity of operational errors. Data-posting types of errors were more likely on the midnight shift, possibly reflecting declines in alertness and vigilance on that shift. Unfortunately, many of the variables related to shift schedules and fatigue were unable to support much analysis because of data quality problems and confounding with air traffic volume. To adequately assess the changes in OED rates as they relate to time of day, an estimate of exposure is needed.

Author

*Air Traffic Control; Schedules; Workloads (Psychophysiology); Alertness; Errors; NASA Programs; Aircraft Safety; Fatigue (Biology)*

19990025683 Air Force Research Lab., Sustained Operations Branch, Brooks AFB, TX USA

**Evaluating Crew Performance After Anti-Emetics: A Screen for Assessing Militarily Relevant Medications**

French, Jonathan, Air Force Research Lab., USA; Benline, Terry A., Air Force Research Lab., USA; Poole, Eric, Air Force Research Lab., USA; September 1998; 10p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Prophylactic, pharmaceutical countermeasures hold the potential to protect aircrews from a wide variety of threats during contingency operations, ranging from fatigue to radiation exposure. In order to assess the impact of these potential countermeasures on cognitive abilities, a 2-phase drug screen was developed. A battery of cognitive, affective and physiological measures was utilized in Phase I of testing to rapidly evaluate the performance liability of militarily relevant compounds. The carefully controlled Phase I lab study incorporated diurnal and nocturnal performance trials to assess potential drug interactions with circadian and sleep deprivation effects. During Phase II, flight performance was tested in a high fidelity aircraft simulator using embedded operational tasks, expert evaluation and subjective metrics. The Phase I screen evaluated two novel anti-emetic compounds, granisetron (2 mg) and ondansetron (8 mg), compared to placebo and a positive control, prochlorperazine (10 mg), in a double blind, crossover study of 24 subjects. Performance was assessed hourly from 1800 until 0200. All Phase I metrics were degraded during nocturnal performance trials for all drug conditions, presumably due to circadian and sleep deprivation effects. The positive control was identified by the divided attention task in terms of accuracy (p less than 0.05) and reaction time (p less than 0.05) and

by the mean lambda for the tracking task ( $p$  less than 0.05), but only during a time when blood levels of prochlorperazine were elevated. None of the affective state questionnaires were able to identify the positive control, suggesting that the dose was low enough that the participants were unable to discern it. None of the target anti-emetic compounds differed from placebo suggesting that they were not likely to affect sensitive performance. Phase II also revealed no differences between target anti-emetic compounds and placebo in any of the segments of an F-16 defensive counter-air mission flown by 9 pilots. Based on these tests, the target compounds were considered safe to use prophylactically, with respect to cognitive ability, for crews in danger of radiation exposure. The utility of the drug screen as a rapid and thorough means to assess the cognitive impact of militarily relevant compounds was established.

Author

*Performance Tests; Countermeasures; Antiemetics and Antinauseants; Flight Crews; Drugs; Human Performance; Radiation Dosage; Sleep Deprivation*

19990025684 Clarke Inst. of Psychiatry, Toronto, Ontario Canada

**Melatonin and its Role in Circadian Rhythm Disruption**

Brown, Gregory M., Clarke Inst. of Psychiatry, Canada; Vos, Evert C., Clarke Inst. of Psychiatry, Canada; September 1998; 10p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Melatonin, the hormone of the pineal gland, is secreted during the hours of darkness with virtually no secretion during light and has therefore been called the hormone of darkness. Its secretion is controlled by an endogenous rhythm generating system that is entrained by light. Melatonin has a role in cuing circadian rhythms, notably the sleep-wake rhythm, promoting sleep, and contributing significantly to the circadian rhythm in body temperature. Specific receptors for melatonin have been cloned recently which mediate these and other effects. (Melatonin can be given orally, intravenously, by nasal spray or transbucally and has a wide safety margin.) Administration of melatonin orally (in a dose of 0.5 to 5 mg) or light treatment (300 to 5000 lux) has established therapeutic actions in circadian rhythm sleep disorders, including disorders associated with jet lag, shift work, delayed phase sleep disorder, periodic sleep disorder in blindness and sleep and behavioural disorders in children with multiple brain damage. Treatment of circadian rhythm disorders with light or melatonin requires an understanding of the manner in which these agents produce effects on body rhythms. Effects of light and melatonin treatment follow a phase response curve. Evening light treatment causes a phase delay in the sleep-wake cycle while morning light causes a phase advance. As is befitting the hormone of darkness, melatonin treatment produces effects which are nearly the mirror image of light.

Author

*Circadian Rhythms; Light (Visible Radiation); Sleep; Hormones; Regulatory Mechanisms (Biology)*

19990026497 Civil Aeromedical Inst., Oklahoma City, OK USA

**Predictors of Perceived Empowerment: An Initial Assessment *Final Report***

Thompson, Richard C., Civil Aeromedical Inst., USA; Bailey, Lawrence L., Civil Aeromedical Inst., USA; Farmer, William L., Civil Aeromedical Inst., USA; Sep. 1998; 14p; In English

Report No.(s): DOT/FAA/AM-98/24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Empowerment of employees regarding their work procedures is considered an important approach to improved organizational effectiveness. Recent research suggests that employee empowerment is related to a number of variables besides organizational structure and the use of teams. The present paper examined a number of organizational context variables, obtained from three samples in two government agencies. Perceptions of empowerment were then predicted from these context variables. The results show that perceptions of communication are the strongest predictor of empowerment perceptions across samples. In addition, the size of the communication slope estimate (B value) did not differ across the sample. The results support the contention that context factors besides teams and restructuring are related to empowerment. Specifically, communication perceptions are consistently the strongest predictor across samples and measures. Future research should examine the mechanisms that relate communication and empowerment.

Author

*Research; Management Planning; Improvement; Workloads (Psychophysiology)*

## MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

*Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.*

19990025334 Civil Aeromedical Inst., Oklahoma City, OK USA

**Concepts Providing for Physiological Protection after Aircraft Cabin Decompression in the Altitude Range of 60,000 to 80,000 Feet Above Sea Level *Final Report***

Garner, Robert P., Civil Aeromedical Inst., USA; February 1999; 18p; In English

Report No.(s): DOT/FAA/AM-99/4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The European aircraft Concorde provides evidence that the technology required for building supersonic passenger transport has long been available. In the USA, development efforts for this type of airplane were functionally abandoned in the early 1970s. In recent years, changes in technology, world political structures, and economics have stimulated interest in the development of a fleet of supersonic transports for use in civilian aviation. The future aircraft has been designated the High Speed Civil Transport (HSCT). As part of the development process, all potential challenges associated with design characteristics of the aircraft must be addressed. This report reviews the physiological issues related to cabin decompression during high-altitude flight. A number of strategies for protecting passengers and crewmembers after high-altitude cabin decompression are discussed. Due to the physiological consequences associated with high-altitude decompression, a combination of protective systems may be necessary. At a minimum, it would appear that increased structural integrity of the cabin, a repressurization system, and an optimally designed supplemental oxygen system for crew and passengers are required.

Author

*Aircraft Compartments; Pressure Reduction; Structural Failure; Design Analysis; Physiology; High Altitude*

19990025584 Montana State Univ., Bozeman, MT USA

**More Favored than the Birds: The Manned Maneuvering Unit in Space, Chapter 13**

Millbrooke, Anne, Montana State Univ., USA; From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners; 1998, pp. 299-319; In English; ISBN 0-16-049640-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Manned Maneuvering Unit (MMU) gave astronauts the ability to maneuver in outer space, outside of the spacecraft free of tether lines. This allows the astronauts the freedom to engage in extravehicular activity independent of the constraints of a tether. Without the development of protective, pressurized suits capable withstanding the extremes of outer space, the manned maneuvering unit would not have been useful. Thus there is included in this essay, a description of the development of the space suits. The first use of the MMU was in 1984, and involved testing the unit for the rescue of the Solar Max satellite. The MMU has not been used since 1984. This is due in part because extravehicular activity has been as effective using tethers, safety grips, hand holds and other restraints. The development of the robotic arm has proved effective at retrieving errant satellites, and the MMU has not had a mission, or a customer.

CASI

*Extravehicular Activity; Manned Maneuvering Units; Rescue Operations; Space Suits; Self Maneuvering Units*

19990025599 Institute of Space Medico, Beijing, China

**Some problems in constructing human body impact dynamic model**

Liu, Bingkun, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 381-384; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

In manned spaceflight, human body is subjected to various dynamic factors (impact, vibration, etc.), and impact force may cause damages to human tissues and organs. Human body impact dynamic model is discussed from the following aspects: type of the model, the number of degrees of freedom, characteristics of the model, selection of the physical parameters, nonlinear problems, verification and application of the model and so on. The model should be constructed on the basis of reasonable hypotheses and reliable experimental data and the key to the question is the determination of the physical parameters in the model. The model verified by tests will be of wide application in manned spaceflight: it can be used for calculating human body dynamic response to impact, optimizing parameters of preventive systems to minimize the injury and determining the limits of human impact exposure.

Author

*Human Body; Dynamic Models; Dynamic Response; Impact Damage; Vibration; Biodynamics*

19990025600 Institute of Space Medico, Beijing, China

**Measurement and estimation of flow distribution of air allocated module in air ventilated suit**

Yu, Xuejun, Institute of Space Medico, China; Wu, Jianmin, Institute of Space Medico, China; Xu, Guolin, Institute of Space Medico, China; Wang, Xianzhang, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 369-372; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Flow distribution (FD) of an air allocated module in air ventilated suit was measured and calculated. The results indicate that the module's FD to head, arms, and legs are 35%, 35%, 30% respectively under normally used steady air flow (100-160 L/min). There was no stable FD when the flow fluctuated or air supply to the module was insufficient. The method used in this work is simple and reliable and an algorithm for estimating the FD by measuring flow resistance was established. The error of calculated FD is less than 2% comparing with the measured FD.

Author

*Flow Measurement; Air Flow; Ventilation; Spacecraft Modules; Space Suits; Flow Resistance*

19990025605 Institute of Space Medico, Beijing, China

**A new method of oxygen generation inside a small biocabin**

Li, Xianggao, Institute of Space Medico, China; Chen, Mei, Institute of Space Medico, China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 377-380; In Chinese; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

The metabolism of insects and the seeds are low and the oxygen consumptions are small. Therefore a new method was developed for life support system inside the small biocabin on board satellite. Potassium superoxide was wrapped in a polypropylene membrane. Carbon dioxide can penetrate this membrane and revivify the potassium superoxide directly to regenerate oxygen. Part of the carbon dioxide was absorbed by lithium hydroxide to balance the oxygen partial pressure so that its fluctuation can be maintained within +/-10%. Experiment on board biosatellite proved that the system works well for seeds and insects.

Author

*Oxygen Production; Oxygen Supply Equipment; Lithium Hydroxides; Life Support Systems; Biosatellites; Spacecraft Cabins; Insects; Seeds*

19990025618 Institute of Aviation Medicine, Beijing, China

**An assessment of +Gz protection afforded by different extended bladder coverage anti-G suits**

Geng, Xichen, Institute of Aviation Medicine, China; Zhan, Changlu, Institute of Aviation Medicine, China; Yan, Guiding, Institute of Aviation Medicine, China; Lu, Xia, Institute of Aviation Medicine, China; Chu, Xu, Institute of Aviation Medicine, China; Zhang, Lifan, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; October 1996; ISSN 1002-0837; Volume 9, No. 5, pp. 317-323; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Three extended bladder coverage (EBC,) anti-G suits were evaluated on the centrifuge and were compared with the standard (Std) KH-3 five bladder and the full coverage capstan (FCC) anti-G suits. Bladders of the Std and three EBC anti-G suits covered approximately 30%, 43%, 65%, and 90%, respectively, of the lower body measuring from the umbilicus. Relaxed +Gz tolerances were determined in 5 subjects wearing these anti-G suits by rapid onset centrifuge runs (ROR). Protection afforded by Std, EBC (43%, 65%, and 90%) and FCC anti-G suits were 1.45, 2.13, 2.80, 3.60, and 1.85 G, respectively. However, at +5Gz (with anti-G suit inflation) exposures, HR with the 65% and the 90% EBC anti-G suits were significantly (P less than 0.01) lower than that with the Std anti-G suit. These results indicated that EBC anti-G suits significantly enhanced +Gz tolerance and reduced HR as compared with the Std anti-G suit.

Author

*Acceleration Tolerance; Acceleration Stresses (Physiology); Pressure Suits*

19990025825 NASA Johnson Space Center, Houston, TX USA

**EVA Roadmap: New Space Suit for the 21st Century**

Yowell, Robert, NASA Johnson Space Center, USA; HEDS-UP Mars Exploration Forum; 1998, pp. 59-60; In English; See also 19990025822; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

New spacesuit design considerations for the extra vehicular activity (EVA) of a manned Martian exploration mission are discussed. Considerations of the design includes: (1) regenerable CO<sub>2</sub> removal, (2) a portable life support system (PLSS) which would include cryogenic oxygen produced from in-situ manufacture, (3) a power supply for the EVA, (4) the thermal control systems, (5) systems engineering, (5) space suit systems (materials, and mobility), (6) human considerations, such as improved

biomedical sensors and astronaut comfort, (7) displays and controls, and robotic interfaces, such as rovers, and telerobotic commands.

CASI

*Astronauts; Carbon Dioxide Removal; Extravehicular Activity; Life Support Systems; Mars (Planet); Portable Life Support Systems; Roving Vehicles; Space Suits; Manned Mars Missions; Robotics; Exobiology; Oxygen Supply Equipment; Waste Management*

19990025826 NASA Johnson Space Center, Houston, TX USA

#### **Crew Health and Performance on Mars**

Stegemoeller, Charlie, NASA Johnson Space Center, USA; HEDS-UP Mars Exploration Forum; 1998, pp. 61-67; In English; See also 19990025822; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The issues surrounding the health and performance on Mars of a human crew are discussed in this presentation. The work of Human Space Life Sciences Program Office (HSLSPO) in the preparation of a crew for a Martian mission is reviewed. This includes a review of issues relating to human health and performance (HHP) in space and microgravity. The Mars design reference mission requires the most rigorous life sciences critical path of any manned mission in the foreseeable future. This mission will require a 30 months round trip, with 4 different transistions to different gravities, and two episodes of high gravity load, during the Mars and Earth Aerobraking exercises. A graph is presented which shows the number of subjects with human space flight experience greater than 30 days. A chart presents the physical challenges to HHP in terms of gravity and acceleration and the length of times the crew will be exposed to the various gravity loads. Another chart presents the radiation challenges to the HHP for the duration of the trip. The human element is the most complex element of the mission design. Some challenges (i.e., human engineering and life support) must be overcome, and some issues such as bone loss, and radiation exposure must be addressed prior to making a decision for a manned Martian mission.

CASI

*Aerospace Medicine; Bone Demineralization; Human Factors Engineering; Life Support Systems; Microgravity; Mission Planning; Radiation Dosage; Spacecrews; Manned Mars Missions; Bioastronautics; Astronaut Performance; Gravitational Effects*

19990025827 NASA Johnson Space Center, Houston, TX USA

#### **Preparing for Human Exploration**

Drake, Bret G., NASA Johnson Space Center, USA; Joosten, B. Kent, NASA Johnson Space Center, USA; HEDS-UP Mars Exploration Forum; 1998, pp. 69-80; In English; See also 19990025822; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

NASA's Human Exploration and Development of Space (HEDS) Enterprise is defining architectures and requirements for human exploration that radically reduce the costs of such missions through the use of advanced technologies, commercial partnerships and innovative systems strategies. In addition, the HEDS Enterprise is collaborating with the Space Science Enterprise to acquire needed early knowledge about Mars and to demonstrate critical technologies via robotic missions. This paper provides an overview of the technological challenges facing NASA as it prepares for human exploration. Emphasis is placed on identifying the key technologies including those which will provide the most return in terms of reducing total mission cost and/or reducing potential risk to the mission crew. Top-level requirements are provided for those critical enabling technology options currently under consideration.

Author

*Cost Reduction; Manned Mars Missions; Bioastronautics; Aerospace Medicine; Closed Ecological Systems; Radiation Tolerance; Weightlessness; Planetary Environments; Medical Science; Life Support Systems; Environmental Engineering; Physiological Effects; Human Factors Engineering; Spacecraft Propulsion*

19990025828 NASA Lewis Research Center, Cleveland, OH USA

#### **Power Systems for Human Exploration Missions**

Cataldo, Robert L., NASA Lewis Research Center, USA; HEDS-UP Mars Exploration Forum; 1998, pp. 81-87; In English; See also 19990025822; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Power system options were reviewed for their appropriateness to meet mission requirements and guidelines. Contending system technologies include: solar, nuclear, isotopic, electro-chemical and chemical. Mission elements can basically be placed into two categories; in-space transportation systems, both cargo and piloted; and surface systems, both stationary and mobile. All transportation and surface element power system requirements were assessed for application synergies that would suggest common

hardware (duplicates of the same or similar design) or multi-use (reuse system in a different application/location), wherever prudent.

Author

*Mission Planning; Power Supplies; Electric Power Supplies; Spacecraft Power Supplies; Propellants; Mars (Planet); Manned Mars Missions; Mars Exploration*

19990025834 Texas A&M Univ., College Station, TX USA

*System Study of a Surface Habitat and a Transit Vehicle for a Manned Mission to and From Mars*

Brown, Tony, Texas A&M Univ., USA; Hebert, Brian, Texas A&M Univ., USA; Hestilow, Colin, Texas A&M Univ., USA; Rogers, Jeff, Texas A&M Univ., USA; Sykes, Starlee, Texas A&M Univ., USA; McConnell, Joshua, Editor, Texas A&M Univ., USA; HEDS-UP Mars Exploration Forum; 1998, pp. 157-170; In English; See also 19990025822; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The continued technology advancement over the last several decades has provided the impetus for ambitious individuals to look towards exploration and possible settlement of the frontiers that exist beyond the boundaries of Earth. NASA has expressed a need for the development of a system to provide life sustaining functions for the duration of a three phase mission to and from Mars, including a 500 day expedition on the surface. A preliminary design for a Mars habitation and transportation system was developed to fulfill the need expressed by NASA after down-selecting from several conceptual designs. The design team assigned to this task was divided into subteams responsible for key function groups. These function groups are avionics, power and mobility, environmental controls and life support (ECLSS), and structures. This systems report gives an overview of the total system with attention given to each of these key functional groups. For further information and detail on a specific functional group, refer to the individual reports for that function group. The problem definition section of the report includes the need statement and need analysis, from which the specific need is expressed and the key system constraints imposed. The major functions resulting from the need analysis were that the habitation and transportation system must provide transportation, meet the constraints imposed by the shuttle, provide habitation needs, and allow for a Martian surface expedition. Following the function structure are the functional and performance requirements, which allocate specific numbers and constraints to particular concepts of the need. Calculations as well as assumptions are involved in the process of determining system performance requirements. The system description contains basic drawings of the system and a description of major interfaces. A failure modes and effects analysis and a summary of component costs of the system are also included.

Author

*Environmental Control; Functional Design Specifications; Life Support Systems; Mars Surface; Manned Mars Missions; Mars Exploration; Space Habitats; Closed Ecological Systems; Avionics; Space Rations*

19990026123 Institute for Human Factors TNO, Soesterberg, Netherlands

*Identification of Personnel Qualifications of Future Human-Machine Systems: An Exploration and Research Plan Final Report Identificatie van personeelskwalificaties van toekomstige mens-machine systemen: Een verkenning en onderzoeksplan*

Essens, P. J. M. D., Institute for Human Factors TNO, Netherlands; Riemersma, J. B. J., Institute for Human Factors TNO, Netherlands; Oving, A. B., Institute for Human Factors TNO, Netherlands; Sep. 09, 1998; 18p; In Dutch

Contract(s)/Grant(s): A97/KM/329

Report No.(s): TD98-0259; TM-98-A049; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., PO Box 23, Kampweg 5, 3769 DE Soesterberg, The Netherlands), Hardcopy, Microfiche

Each system comprising an organization of people and machines assumes a certain competence with the people. Competence is the sum of the starting competence level, the general training, the function-specific training and operational experiences. Additional to the ergonomic factors, the personnel factors affect the feasibility and optimisation of the system design. As far as we know there is no systematic approach to deduce such affects. The research proposed seeks to develop such a systematic approach in the context of the research of function allocation and manning models for the future human-machine systems of the Royal Netherlands Navy.

Author

*Man Machine Systems; Education; Systems Engineering*



19990026200 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Nutrition and Food Research Inst., Zeist, Netherlands

*Field Test with the Interim Arctic Ration Final Report Veldbeproevingen van het Interim Arctisch Rantsoen*

vanGemert, L. J., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; November 1998; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): A98/KL/101

Report No.(s): TD98-0363; TNO-Voeding-V98.1032; Copyright; Avail: Issuing Activity (TNO Nutrition and Food Research Inst., P.O. Box 360, NL-3700 AJ Zeist, The Netherlands), Hardcopy, Microfiche

In the period February-March 1998 field tests were executed with the interim Arctic ration during military exercises in the Netherlands, Norway, Germany and France of Dutch army units of the marine corps, the 'Luchtmobiele Brigade' (air-mobile brigade) and the commando corps. For the field tests a total of 239 man filled in a questionnaire after having used the ration. The field tests were executed in conformity with the recent protocol for field tests of military rations. In general the interim Arctic ration was judged positively. Especially the snackpack was appreciated. Based on the answers given a list was made containing suggestions for specific improvements of the ration. Furthermore, based on the experiences obtained from the field tests a number of adjustments or improvements are suggested concerning the protocol for field tests of military rations.

Author

*Field Tests; Rations; Armed Forces (Foreign)*

19990026516 Department of the Navy, Washington, DC USA

*Insulation Jacket for Breathing Gas Device*

Hughes, Robert, Inventor; Haven, Lynn, Inventor; Courson, Billy, Inventor; Rudolph, Joseph, Inventor; Sep. 22, 1998; 7p; In English; Supersedes

Patent Info.: Filed 8 Aug. 96,

Report No.(s): AD-D019226; PAT,ALL-695,845; PAT-5,809,998; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An insulation jacket is provided for a breathing gas device. A first jacket portion wraps completely about the device's cylinder and gas delivery valve. A second jacket portion wraps about a high-pressure regulator coupled in-tune with the gas delivery valve and a plurality of gas delivery conduits extending from the high-pressure regulator. The first and second jacket portions are formed from a flexible insulating material of laminate construction. A plurality of fastening strips, e.g., hook-and-loop fastening strips, cooperate with first and second jacket portions after they are wrapped about the respective portions of the breathing gas device. DTIC

*Gas Flow; Laminates; Breathing Apparatus; Gas Mixtures*

19990026639 Department of the Navy, Washington, DC USA

*Self-Contained Oxygen Rebreather With Semi-Permeable Membrane to Vent Excess Helium*

Gorin, Steve, Inventor; Jul. 14, 1998; 5p; In English; Supersedes US-Patent-Appl-SN-803207

Patent Info.: Filed 11 Feb. 97.; US-Patent-Appl-SN-803,207; US-Patent-5,778,876

Report No.(s): AD-D019258; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A self-contained underwater breathing loop apparatus for an oxygen rebreather includes a breathing bag formed to act as a compliant volume and a semipermeable membrane arranged to divide the breathing bag into a first chamber and a second chamber. A breathing hose is connected between a mouthpiece and the first chamber of the breathing bag to conduct exhaust breath from the diver thereto. The semipermeable membrane is formed to allow helium in the diver's exhaust breath to pass therethrough while preventing oxygen in the exhaust breath from being transported from the first chamber into the second chamber. A relief valve in the second chamber allows helium in the second chamber to be expelled into the water. A CO<sub>2</sub> scrubber is in fluid communication with the first chamber of the breathing bag. A helium supply in fluid communication with the CO<sub>2</sub> scrubber for supplying helium to the breathing loop through a metering valve. The helium supply preferably may be manually controlled by the diver to add helium in controlled amounts to the breathing loop to permit the diver to descend to a greater depth.

DTIC

*Oxygen; Relief Valves; Breathing Apparatus; Helium*

# Subject Term Index

## A

ABDOMEN, 27  
ACCELERATION STRESSES (PHYSIOLOGY), 28, 32  
ACCELERATION TOLERANCE, 9, 32  
ADDITIVES, 2  
AEROEMBOLISM, 10  
AEROSPACE ENVIRONMENTS, 3  
AEROSPACE MEDICINE, 7, 10, 11, 12, 13, 17, 20, 23, 24, 28, 33  
AIR, 10  
AIR FLOW, 32  
AIR TRAFFIC CONTROL, 29  
AIR TRAFFIC CONTROLLERS (PERSONNEL), 29  
AIR TRANSPORTATION, 17, 18, 19, 20, 21, 24  
AIRCRAFT COMPARTMENTS, 31  
AIRCRAFT MANEUVERS, 12  
AIRCRAFT PILOTS, 12, 16  
AIRCRAFT SAFETY, 11, 12, 13, 29  
ALERTNESS, 7, 11, 13, 15, 29  
ALGORITHMS, 3  
AMPHETAMINES, 2, 14  
ANIMALS, 2  
ANOXIA, 8  
ANTIEMETICS AND ANTINAUSEANTS, 30  
ANTIGENS, 10, 27  
ANTISEPTICS, 21  
ARMED FORCES, 25  
ARMED FORCES (FOREIGN), 35  
ARTERIES, 22  
ASTRONAUT PERFORMANCE, 33  
ASTRONAUTS, 33  
ATMOSPHERIC COMPOSITION, 1  
ATTITUDE (INCLINATION), 9  
AVIONICS, 34

## B

BACKGROUND RADIATION, 2  
BATTERY CHARGERS, 26  
BAYES THEOREM, 3  
BED REST, 9  
BIBLIOGRAPHIES, 7  
BIOASTRONAUTICS, 7, 10, 12, 33  
BIODYNAMICS, 31  
BIOLOGICAL EFFECTS, 7, 10, 11, 12, 13, 27, 28

BIOMEDICAL DATA, 2  
BIOREACTORS, 6  
BIOSATELLITES, 32  
BIOTECHNOLOGY, 6  
BIOTELEMETRY, 23, 24, 25  
BLOOD, 7, 21, 22  
BLOOD FLOW, 8, 9  
BLOOD PRESSURE, 8, 9  
BLOOD VOLUME, 8  
BOMBER AIRCRAFT, 11  
BONE DEMINERALIZATION, 33  
BREATHING APPARATUS, 35  
BUBBLES, 10  
BYPASSES, 22

## C

CAFFEINE, 7, 15  
CANCER, 7, 27  
CARBON DIOXIDE REMOVAL, 33  
CARDIOVASCULAR SYSTEM, 8, 9, 10  
CARTILAGE, 4  
CASUALTIES, 17, 18, 20, 25  
CATALYSTS, 6  
CAVITIES, 27  
CELLS (BIOLOGY), 5, 10, 22, 27  
CENTRAL NERVOUS SYSTEM STIMULANTS, 14, 15  
CENTRIFUGAL FORCE, 5  
CEREBRUM, 8  
CHEMICAL ENGINEERING, 6  
CIRCADIAN RHYTHMS, 16, 28, 30  
CIRCULATORY SYSTEM, 10  
CLIMATE CHANGE, 1  
CLIMATOLOGY, 1  
CLOSED ECOLOGICAL SYSTEMS, 33, 34  
COGNITION, 15  
COMPUTERIZED SIMULATION, 26  
CONFERENCES, 11, 27  
CONGRESSIONAL REPORTS, 2  
CONTINGENCY, 11, 22, 25  
COST EFFECTIVENESS, 18  
COST REDUCTION, 33  
COUNTERMEASURES, 15, 30  
CULTURE TECHNIQUES, 1, 4, 5  
CYTOMETRY, 6, 7

## D

DATA BASES, 2  
DECOMPRESSION SICKNESS, 10  
DELAY, 2  
DEOXYRIBONUCLEIC ACID, 6  
DEPLOYMENT, 18, 24  
DESIGN ANALYSIS, 31  
DESYNCHRONIZATION (BIOLOGY), 16  
DIAGNOSIS, 19  
DOGS, 10  
DRUGS, 14, 30  
DYNAMIC CHARACTERISTICS, 26  
DYNAMIC MODELS, 31  
DYNAMIC RESPONSE, 31

## E

EAR, 8  
EDUCATION, 2, 34  
ELECTRIC BATTERIES, 26  
ELECTRIC POWER SUPPLIES, 34  
ELECTROCARDIOGRAPHY, 9, 26  
ELECTROMAGNETIC FIELDS, 27  
EMERGENCIES, 19  
ENDOTHELIUM, 1, 10  
ENVIRONMENTAL CONTROL, 34  
ENVIRONMENTAL ENGINEERING, 33  
ENZYMES, 6  
EPIDEMIOLOGY, 22  
ERRORS, 29  
ESTIMATES, 1  
EVACUATING (TRANSPORTATION), 17, 18, 20, 21  
EVALUATION, 8  
EVASIVE ACTIONS, 12  
EVOKED RESPONSE (PSYCHOPHYSIOLOGY), 2  
EXO BIOLOGY, 7, 33  
EXPOSURE, 23, 27, 28  
EXTRATERRESTRIAL RADIATION, 4  
EXTRAVEHICULAR ACTIVITY, 31, 33

## F

FATIGUE (BIOLOGY), 29  
FEAR, 2  
FIBRILLATION, 26  
FIELD TESTS, 19, 35

FLIGHT CREWS, 11, 12, 20, 23, 30  
 FLIGHT FATIGUE, 11, 12, 13  
 FLIGHT OPERATIONS, 13  
 FLIGHT SAFETY, 11, 13  
 FLIGHT STRESS (BIOLOGY), 16  
 FLOW MEASUREMENT, 32  
 FLOW RESISTANCE, 32  
 FLOW VELOCITY, 22  
 FOLDING, 3  
 FREE FALL, 1  
 FUNCTIONAL DESIGN SPECIFICATIONS, 34

## G

GAS FLOW, 35  
 GAS MIXTURES, 10, 35  
 GENETICS, 27  
 GEOCHEMISTRY, 1  
 GLACIERS, 1  
 GLUCOSE, 19  
 GRAVITATION, 4  
 GRAVITATIONAL EFFECTS, 3, 4, 5, 28, 33  
 GRAVITATIONAL FIELDS, 4  
 GRAVITATIONAL PHYSIOLOGY, 28  
 GROUND CREWS, 16

## H

HALF LIFE, 16  
 HEAD DOWN TILT, 9  
 HEALTH, 17  
 HEART FUNCTION, 10  
 HEART RATE, 8, 9  
 HELIUM, 35  
 HEMATOCRIT, 19  
 HEMOGLOBIN, 19, 22  
 HEURISTIC METHODS, 3  
 HIGH ALTITUDE, 31  
 HIGH GRAVITY ENVIRONMENTS, 12  
 HORMONES, 16, 30  
 HUMAN BODY, 4, 31  
 HUMAN FACTORS ENGINEERING, 11, 33  
 HUMAN PERFORMANCE, 16, 26, 30  
 HUMAN TOLERANCES, 9  
 HYPERTHERMIA, 22  
 HYPOXIA, 8

## I

IMAGE CLASSIFICATION, 24  
 IMAGE ENHANCEMENT, 24

IMAGING TECHNIQUES, 21, 24  
 IMMUNE SYSTEMS, 1, 6, 10  
 IMMUNITY, 10  
 IMMUNOLOGY, 1, 6, 23  
 IMPACT DAMAGE, 31  
 IMPROVEMENT, 30  
 IN-FLIGHT MONITORING, 8, 14  
 INDEXES (DOCUMENTATION), 7  
 INFECTIOUS DISEASES, 22, 23  
 INFORMATION PROCESSING (BIOLOGY), 15  
 INJURIES, 20  
 INSECTS, 23, 32  
 INTERNATIONAL COOPERATION, 25, 26  
 INTERNATIONAL LAW, 26

## J

JET LAG, 16

## L

LAMINATES, 35  
 LEUKOCYTES, 7, 27  
 LIFE SUPPORT SYSTEMS, 11, 19, 32, 33, 34  
 LIGHT (VISIBLE RADIATION), 30  
 LIQUID OXYGEN, 20  
 LITHIUM HYDROXIDES, 32  
 LOADS (FORCES), 26  
 LOWER BODY NEGATIVE PRESSURE, 8  
 LYMPHOCYTES, 1, 4

## M

MACROPHAGES, 10  
 MAN MACHINE SYSTEMS, 34  
 MANAGEMENT PLANNING, 30  
 MANNED MANEUVERING UNITS, 31  
 MANNED MARS MISSIONS, 33, 34  
 MARS (PLANET), 33, 34  
 MARS EXPLORATION, 34  
 MARS SURFACE, 34  
 MEDICAL ELECTRONICS, 23, 24  
 MEDICAL EQUIPMENT, 11, 19, 24, 26  
 MEDICAL PERSONNEL, 11  
 MEDICAL SCIENCE, 3, 23, 24, 33  
 MEDICAL SERVICES, 11, 17, 18, 19, 20, 21, 24, 25  
 MENTAL PERFORMANCE, 15  
 MICROBIOLOGY, 6  
 MICROGRAVITY, 3, 4, 5, 10, 33

MICROORGANISMS, 1  
 MICROWAVE EQUIPMENT, 28  
 MILITARY OPERATIONS, 7, 17, 18, 21, 23, 24, 25, 26  
 MILITARY PSYCHOLOGY, 25, 26  
 MISSION PLANNING, 33, 34  
 MOLECULAR BIOLOGY, 3  
 MONKEYS, 2

## N

NASA PROGRAMS, 29  
 NEAR INFRARED RADIATION, 8  
 NERVOUS SYSTEM, 9, 13  
 NETS, 23  
 NEUROPHYSIOLOGY, 5  
 NIGHT, 11  
 NORTH ATLANTIC TREATY ORGANIZATION (NATO), 25, 26

## O

OPERATIONAL PROBLEMS, 17  
 OPERATIONS RESEARCH, 11  
 ORTHOSTATIC TOLERANCE, 9  
 OXIMETRY, 20  
 OXYGEN, 10, 35  
 OXYGEN CONSUMPTION, 8, 21  
 OXYGEN PRODUCTION, 32  
 OXYGEN SUPPLY EQUIPMENT, 20, 32, 33

## P

PARASITIC DISEASES, 22  
 PATIENTS, 17, 19, 20  
 PEACETIME, 25, 26  
 PELVIS, 27  
 PERCEPTION, 26  
 PERFORMANCE TESTS, 15, 29, 30  
 PERIODIC VARIATIONS, 1  
 PERITONEUM, 21  
 PERSONNEL, 26  
 PHARMACOLOGY, 13, 14, 15  
 PHYSIOLOGICAL EFFECTS, 9, 16, 28, 33  
 PHYSIOLOGICAL RESPONSES, 27  
 PHYSIOLOGY, 8, 19, 31  
 PILOT PERFORMANCE, 11, 12, 14, 16  
 PILOTS, 16  
 PILOTS (PERSONNEL), 8  
 PLANETARY ENVIRONMENTS, 33  
 POLYMORPHISM, 6  
 PORTABLE EQUIPMENT, 26

PORTABLE LIFE SUPPORT SYSTEMS, 33  
POTASSIUM CHLORIDES, 19  
POWER SUPPLIES, 34  
PRESSURE REDUCTION, 31  
PRESSURE SUITS, 32  
PREVENTION, 17, 22  
PRIORITIES, 23  
PROCEDURES, 21  
PROLONGATION, 11  
PROPELLANTS, 34  
PROTEINS, 3  
PSYCHOLOGICAL EFFECTS, 25  
PSYCHOLOGICAL TESTS, 25  
PSYCHOMOTOR PERFORMANCE, 15, 16  
PSYCHOSES, 2  
PULSES, 8

## R

RADIATION DOSAGE, 30, 33  
RADIATION EFFECTS, 28  
RADIATION TOLERANCE, 33  
RADIOGRAPHY, 21  
RADIOLOGY, 24  
RATIONS, 35  
REGULATORY MECHANISMS (BIOLOGY), 30  
RELIEF VALVES, 35  
RESCUE OPERATIONS, 17, 31  
RESEARCH, 3, 4, 5, 30  
RESEARCH AND DEVELOPMENT, 11  
RESPIRATION, 9, 10  
REST, 12  
RESUSCITATION, 22  
RHODAMINE, 5  
RISK, 22, 23  
ROBOTICS, 33  
ROTATION, 4, 5  
ROVING VEHICLES, 33

## S

SAFETY, 23  
SCHEDULES, 29  
SCHIZOPHRENIA, 2  
SEA STATES, 26  
SEEDS, 32  
SELF MANEUVERING UNITS, 31  
SHOCK (PHYSIOLOGY), 27  
SIMULATION, 29  
SIMULATORS, 3, 4  
SLEEP, 13, 16, 30

SLEEP DEPRIVATION, 7, 12, 13, 14, 15, 16, 30  
SODIUM CHLORIDES, 19  
SPACE HABITATS, 34  
SPACE RATIONS, 34  
SPACE SUITS, 31, 32, 33  
SPACECRAFT CABINS, 32  
SPACECRAFT MODULES, 32  
SPACECRAFT POWER SUPPLIES, 34  
SPACECRAFT PROPULSION, 33  
SPACECREWS, 33  
SPECTRA, 26  
SPECTRUM ANALYSIS, 9  
SPINAL CORD, 20  
STRESS (PSYCHOLOGY), 8, 25  
STRESS-STRAIN RELATIONSHIPS, 26  
STRUCTURAL FAILURE, 31  
SUBSTITUTES, 25  
SUPPORT SYSTEMS, 18, 20  
SURGERY, 18, 19, 21, 22  
SURVEYS, 22  
SYSTEMS ENGINEERING, 34

## T

TELECOMMUNICATION, 23  
TELECONFERENCING, 23, 24, 25  
TELEMEDICINE, 11, 23, 24, 25  
TEMPERATURE GRADIENTS, 1  
THERAPY, 6  
THERMAL MAPPING, 21  
THROMBOSIS, 22

## U

ULTRASONICS, 21, 24

## V

VACCINES, 23  
VENTILATION, 32  
VENTILATORS, 21  
VIBRATION, 31  
VIRUSES, 23

## W

WAKEFULNESS, 13, 14, 15  
WARFARE, 20  
WASTE MANAGEMENT, 33  
WEIGHTLESSNESS, 9, 33  
WEIGHTLESSNESS SIMULATION, 9  
WORK-REST CYCLE, 12, 13

WORKLOADS (PSYCHOPHYSIOLOGY), 16, 29, 30

# Personal Author Index

## A

Afanassiev, B. V., 2  
Albery, W. B., 12  
Anaissie, Elias J., 7  
Ando, Hideki, 3  
Ariznavarreta, C., 16  
Armstrong, S., 11  
Arnold, F. H., 5

## B

Bailey, Lawrence L., 30  
Baranski, Joseph V., 14  
Barraud, Pierre-Alain, 14  
Batejat, D., 15  
Beninati, Bill, 18, 24  
Beninati, William, 17  
Benline, Terry A., 29  
Bey-Wright, Regina, 16  
Bi, Kexu, 8  
Biggers, Butch, 18  
Bougine, S., 12  
Bradley, Donald, 21  
Bradley, Donald V., 21  
Brandon, William T., 23  
Brown, Gregory M., 30  
Brown, Tony, 34  
Bruijnzeel, P.L., 1

## C

Cabon, P., 12  
Cai, H., 6  
Caldwell, John A., Jr., 13  
Cardinali, D. P., 16  
Carlton, P. K., 18, 21  
Carlton, P. K., Jr., 17, 18, 24  
Carlton, Paul K., Jr., 17  
Carmichael, F. J. Lou, 22  
Cataldo, Robert L., 33  
Chauffard, F., 15  
Chelette, T. L., 12  
Chen, Jianhe, 10  
Chen, Mei, 32  
Chen, Xuemei, 8  
Christopher, George W., 23  
Chu, Xu, 32  
Chukhlovin, A. B., 2  
Cian, Corinne, 14

Coblentz, A., 12  
Cogoli, Augusto, 4  
Cogoli-Greuter, Marianne, 4  
Cohen, David M., 7  
Comperatore, Carlos A., 16  
Coopwood, Joseph, 21  
Courson, Billy, 35  
Coward, Richard E., 7  
Crawford, O., 3  
Crutchfield, Jerry, 28  
Cruz, Jesus Medialdea, 25

## D

dAmelio, R., 22  
Davidson, Frank, 23  
Dawson, David L., 21  
Day-Clayton, Melanie, 16  
DellaRocco, Pamela S., 29  
Derdak, Stephen, 17, 20  
Derdak, Steven, 18, 24  
Dobrev-Martinova, T., 25  
Doireau, P., 15  
Dong, Qi, 10  
Drake, Bret G., 33  
Dubrev-Martinova, T., 26  
Duke, Pauline Jackie, 4  
Durso, Francis T., 28  
Dyck, W. R., 19

## E

Edwards, Creighton L., 27  
Eglinton, Gary, 24  
Eitzen, Edward M., Jr., 23  
Enslin, M., 15  
Esken, R. L., 12  
Esquivie, Dominique, 14  
Essens, P. J. M. D., 34  
Evans, John A., 23

## F

Farley, K. M. J., 25, 26  
Farmer, Chris, 17  
Farmer, J. Christopher, 17, 18, 20, 24  
Farmer, William L., 30  
Freckleton, M. W., 24  
Freedman, Ralph S., 7, 27  
French, J., 11

French, Jonathan, 29

## G

Garner, Robert P., 31  
Geng, Xichen, 32  
Gibson, T. M., 17  
Gingras, C., 26  
Golombek, D., 16  
Gomez, S., 7  
Gorin, Steve, 35  
Granados, B., 16  
Grazziutti, Monica L., 7  
Grimm, Elizabeth A., 10  
Grissom, Thomas, 17, 18, 19, 24  
Grissom, Thomas E., 18, 20  
Groen, B., 1  
Gruener, Raphael, 5  
Guz, Evan, 18

## H

Hackworth, Carla A., 28  
Hale, J., 19  
Haven, Lynn, 35  
Hebert, Brian, 34  
Henderson, Ann S., 27  
Hersack, Richard, 18  
Hersack, Richard A., 17  
Hersack, Rick, 17  
Hestilow, Colin, 34  
Heymann, D. L., 22  
Hirayanagi, Kaname, 3  
Holewijn, M., 8  
Hu, Suwei, 8  
Hu, Zhihong, 8  
Hughes, Robert, 35

## I

Inouye, Minoru, 5

## J

Jeffers, Michael, 5  
Jinfu, Yuan, 10  
Johnson, Thomas G., 24  
Joosten, B. Kent, 33  
Jouvet, Michel, 13

## K

Kakimoto, Yukiko, 3  
Kavanagh, John J., 27  
Kelly, Tamsin, 7  
Kilpatrick, Russell, 18, 24  
King, Jim, 18  
Kingma, Stuart J., 22  
Kirby, Albert W., 16  
Kissinger, David P., 21  
Koga, Kazuo, 3, 5  
Kommander, K., 6  
Kudelka, Andrzej P., 27

## L

Lagarde, D., 15  
Lagarde, Didier, 14  
Lawlor, Dennis, 17, 18, 19, 20  
Leiffen, Daniel, 14  
Li, Xianggao, 32  
Licina, J. R., 19  
Light, Jerry T., 21  
Littlefield, Rik, 24  
Liu, Bingkun, 31  
Los, M., 8  
Lu, Xia, 32

## M

Macedonia, Christian R., 24  
Magnin, Anthony A., 22  
Manning, Carol A., 28  
Mano, Tadaaki, 3  
March, Robert, 26  
Martin, M., 16  
Mason, Barbara-Marie, 20  
McConnell, Joshua, 34  
McGeoy, S., 7  
McInerney, Thomas G., 23  
McIntyre, Bradley W., 7  
Meichers, B.P., 1  
Melichar, Bohuslav, 27  
Melichar, Bohuslav, 7  
Meng, Jingrui, 10  
Millbrooke, Anne, 31  
Miller, P. M., 17  
Mollard, R., 12  
Moloff, Alan L., 25  
Montufar-Solis, Dina, 4  
Morales, Carlos, 17, 18  
Mori, Sigeo, 3  
Morris, Tommy, 24

Mourey, F., 12  
Murata, Yoshiharu, 5  
Murphy, P. J., 25, 26

## N

Nakamura, Akio, 3  
Nichols, A., 19  
Nicholson, A. N., 11  
Nikolic, Danko, 28  
Nolan, J. P., 6

## O

Ohira, Yoshinbu, 3  
Oving, A. B., 34

## P

Palo, Paul, 26  
Papier, Kenneth S., 20  
Pearce, F. J., 19  
Pellis, Neal R., 7  
Peng, Yuankai, 9  
Peteet, Dorothy, 1  
Philippens, I.H., 1  
Pierson, Duane L., 7  
Pilcher, John, 18, 21  
Pippia, Proto, 4  
Platsoucas, Chris D., 27  
Poole, Eric, 29  
Poquin, Didier, 14  
Pradella, S., 15  
Prins, H. J., 25  
Przepiorka, Donna, 7  
Putnam, A. Tyler, 21

## Q

Quan, Wang, 10

## R

Radova, Jana, 26  
Ramon, Jose, 18  
Rao, Sambasiva M., 5  
Raphel, Christian, 14  
Reichard, Sherwood M., 27  
Resau, James H., 5  
Rex, John H., 7  
Riemersma, J. B. J., 34  
Rijkkelijkhuizen, J., 8  
Riuvera, Pik, 16  
Rocca, Mitra, 24  
Rogers, Jeff, 34

Roller, Jeffrey I., 24  
Row, Lockard M., 23  
Rubin, R., 7  
Rudolph, Joseph, 35  
Rulong, Shen, 5  
Ryman, D., 7

## S

Salisbury, Timothy, 24  
Sanders, Jay, 23  
Satake, Hirotaka, 3  
Savary, Cherylyn A., 7  
Savary, Cherylyn, 27  
Savary, Cherylyn A., 6  
Sciola, Luigi, 4  
Shan, Yi, 9  
Shemesh, Aldo, 1  
Shen, Xianyun, 10  
Shi, Xiuling, 8  
Sicard, B., 15, 16  
Simons, M., 12, 13  
Skelly, Larry, 24  
Song, Kongzhi, 9  
Spano, Alessandra, 4  
Steffen, Robert, 22  
Stegemoeller, Charlie, 33  
Stivalet, Philippe, 14  
Stone, Barbara M., 11  
Sudoh, Masamichi, 3  
Sugenoya, Junichi, 3  
Sun, Yongen, 9  
Sykes, Starlee, 34  
Sylvester, James C., 26

## T

Tachon, P., 15  
Takagishi, Yoshiko, 5  
Taya, Yasushi, 3  
Tejada, Francisco Rios, 25  
Thompson, Richard C., 30  
Tian, Guangqing, 8  
Tokalov, S. V., 2  
Tresguerres, J., 16  
Trial, JoAnn, 1  
Tripp, L. D., 12  
Truitt, Todd R., 28

## V

Valk, P. J. L., 12, 13  
vanDalen, Albert, 21  
vandeEndt, M., 8  
Vandre, Robert H., 24

vanGemert, L. J., 35  
Vanwersch, R.A., 1  
Verschraegen, Claire, 27  
Villanua, M. A., 16  
Vos, Evert C., 30

## W

Wang, Xianzhang, 32  
White, P. S., 6  
Whitmore, J., 11  
Wiesmann, W. P., 19  
Williams, Christopher S., 23  
Woodside, Darren G., 7  
Wright, Bruce A., 28

Wright, Darlene, 16  
Wu, Jianmin, 32

## X

Xie, Junshui, 9  
Xu, Guolin, 9, 32

## Y

Yagunov, A. S., 2  
Yan, Guiding, 32  
Yang, Jingsheng, 8  
Yangsheng, Jin, 10

Yowell, Robert, 32  
Yu, Xuejun, 32  
Yu, Yaorong, 8, 10

## Z

Zang, Yunning, 8, 10  
Zhan, Changlu, 32  
Zhang, Jingxue, 9  
Zhang, Lifan, 32  
Zhang, Ruguo, 9  
Zhao, Guoxuan, 8  
Zhong, Chongfa, 8  
Zhongyi, Ji, 10  
Ziriaux, John, 28

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